

POPULAR Computing WEEKLY

35p

9-15 June 1983 Vol 2 No 23

This Week

Vic20 software

Mike Grace looks at a range of Vic20 games including *Traxx*, *Lair*, *Jumpin' Jack* and *Starship Escape*. See page 14.

Spectrum paint

Ian Logan presents a series of programs to 'fill-in' triangles, rectangles and circles on page 20.

Dragon scroll

Peter Chase explains how to scroll and shift blocks of memory and presents a simple demonstration game where you must avoid oncoming coloured blocks. See page 22.

New releases

All the latest games for a host of machines including *3D Combat Zone* from Artic and *Vultures* from J Morrison (Micros). See page 45.

★ STAR
Muncher on
16K ZX81.
See page 10.
★ GAME

News Desk

Wealth of new software at ZX fair

THERE was plenty of interest for the 8,000 visitors to London's 7th ZX Microfair, held last Saturday at the Alexandra Pavilion.

Most of the 140 or so exhibitors were software houses, once again demonstrating the strength of independent support for the Sinclair machines.

Of the companies exhibiting for the first time the Edinburgh-based Protek made the biggest impact with six titles

for the Spectrum and ZX81. Other newcomers were Elephant, Electra, Gilsoft and Apocalypse. Vortex and Quest both appeared at a show for the first time with *Gun Law* and *The Black Hole*, respectively.

Romik, best known for its Commodore and Dragon material, launched into the ZX arena with four titles for the Spectrum — *3D Monster*

Continued on page 5



98K Lynx In the high street soon!

A 96K version of the Lynx microcomputer should be in the shops at the end of this month. Computers hopes to display the new Lynx-96 at the Earls Court Computer Fair beginning on June 16.

The enlarged Lynx will cost £299 and will include some Rom features not available on the 48K machine. It will have printer-driver routines for both serial and parallel interface printers and a number of pre-programmed sound effects. In all the 96K machine will have 20K Rom compared with the Lynx-48's 16K Rom.

It will be possible to upgrade the present 48K Lynx to 96K by sending your machine back to Computers, but it will cost £89.95. That price includes both the Ram and Rom upgrades.

In August, Computers hopes to launch its delayed Lynx disc drives. These will be 5¼ inch, single-sided, double-density, 40-track, disc drives.

Continued on page 5

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Continued on page 44

★ ★ BRITAIN'S HOME COMPUTER WEEKLY ★ ★

Critical review?



“The 16k Oric – fighting the 16k Spectrum – is £25 cheaper. It feels a good deal more ‘professional’ than the home-appeal Sinclair. Oric’s sound is extremely versatile, and well up to the standard of the £300 or £400 BBC microcomputer made by Acorn.”

WHICH MICRO?

“Oric will soon be selling a Modem so that Prestel will become available. Owners will be able to accept teletext – programs loaded straight down the phone line – eventually electronic mail could come into the home by the same route, and with the addition of a tape recorder the Oric with its Modem could become a telephone answerer and message taker.”

YOUR COMPUTER

“Instead of the Spectrum’s 28 look-up single-character error reports, the Oric has 18 self-explanatory messages. If you actually want to do computing, rather than just exploring the world of off-the-shelf games programme entertainment the Oric will be a better buy.”

WHICH MICRO?

“Oric was over twice as fast as the Spectrum. Surprisingly perhaps the Oric, which initially seemed only faster when performing the simplest of calculations, has come back to beat the Spectrum by a small amount. As the problems get more complex the Oric comes into its own. One final point – in entering the benchmark tests – the Oric was certainly the easiest to handle.”

WHICH MICRO?

“One good feature of the Oric is an on-screen reminder in the top right hand corner to show that you’ve engaged all-capitals mode. So much better than the BB’s variety of lights in the corner of the keyboard. The Oric is sound, simple to get along with and offers great expansion potential.”

WHICH MICRO?

“A good speaker and built-in noises get the Oric’s sound off to a good start. Typing Zap, Ping, Shoot or Explode produces convincing arcade game noises which can easily be incorporated into any program.”

YOUR COMPUTER

“The sound commands on the Oric 1 are, for a computer of this price, very sophisticated. Three music channels, and one noise channel, mean that you can program some fairly complex sounds.”

POPULAR COMPUTING WEEKLY

“Oric is everything you hoped it would be. Alive with colour, and zapping with built-in sound effects, the Oric looks like a match for any machine now selling for less than £200.”

YOUR COMPUTER

“This slope coupled with the design (all the keys makes the Oric an easy machine to touch-type on. All keys have auto-repeat and there are four keys dedicated specifically to cursor control. It is certainly easier to type on than any of Sinclair’s offerings.”

YOUR COMPUTER

“When compared to the stogginess of the Spectrum’s keyboard this is certainly an improvement. I can’t see any Orics failing through bad assembly. If only the £2400 IBM were so easy to use.”

WHICH MICRO?

“The modem is certainly unusual in a machine of this price. Together with the other peripherals, when finally available, it should make for an attractive package for a small business... surely a match for machines costing much more.”

POPULAR COMPUTING WEEKLY

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Articles which are submitted for publication should not be more than 3,000 words long. The articles, and any accompanying programs, should be original. It is breaking the law of copyright to copy programs out of other magazines and submit them here — so please do not be tempted.

All submissions should be typed and a double space should be left between each line. Please leave wide margins.

Programs should, whenever possible, be computer printed.

We cannot guarantee to return every submitted article or program, so please keep a copy. If you want to have your program returned you must include a stamped, addressed envelope.

Accuracy

Popular Computing Weekly cannot accept any responsibility for any errors in programs we publish, although we will always try our best to make sure programs work.

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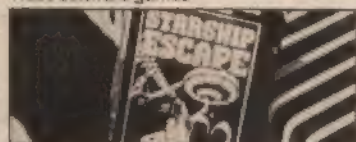
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Editorial

Robotics looks like becoming the next high technology industry to undergo a 'boom'. Not this month, or next month, or even next year, but soon.

Robotics, for those who are unfamiliar with the term, is the science of robots — machines that can walk, talk, speak, understand commands and otherwise imitate human behaviour.

Robots have been popularised by science fiction authors such as Isaac Asimov and in films such as *Star Wars* but, until recently, there has been little sign that robots would ever become more than fictional characters. Admittedly, industrial robots are becoming increasingly common, particularly in Japan, but they are specialised machines dedicated to particular tasks. They do not possess the intelligence, adaptability or mobility which are the hallmarks of the true robot.

Now, however, companies which have specialised in microcomputers and other high technology areas, are actively looking at 'home' robots. Atari founder Nolan Bushnell has already set up a new company — Androbot — to develop and manufacture such robots.

The microcomputer 'boom' still has a long way to run, but companies such as Sinclair might be well advised to start working on personal robots before they get left behind. But then, who knows? Maybe Sinclair is already developing a 'metal mickey' of his own.

Next Thursday

Play our *Star Game* and try and line up four counters horizontally, vertically or diagonally. Connect 4 — next week's game for the BBC by M Kendrick.

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WINDOW ON ANOTHER WORLD

NEW RELEASES

STAR JAMMER — Wiping the sweat from my brow, I searched the inky blackness, ahead for signs of enemy fighters. Through Star Jammer was the best ship in the galaxy, my dwindling energy reserves made me doubt I could reach the next stargate... (a one-player space arcade game requiring one joystick).

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Salamander Software

ZX microfair

Continued from page 1

Maze, Colour Clash, Galactic Trooper and Spectra Smash.

Nearly all of the established houses presented new titles for the Spectrum. Artic showed 3D *Combat Zone*, 3D *Quadracube*, *Cosmic Debris* and *Sys 64* (a 64 column printer routine). Abersoft had *The Wizard's Warriors*, Lothlorien displayed a new wargame, *Johnny Reb* and PSS showed *Light Cycle*.

Both East London Robotics and Fuller were up-grading 16K Spectrums to 48K on the spot, while FB Electronics demonstrated a 24-line port and motherboard for operating a Colne Robotics Zeaker Micro Turtle.

Adding some controversy to the show, Scimitar and Keysoft both exhibited programs enabling back-up copies of 'protected' software to be made — *Zap 2* and *The Key*.

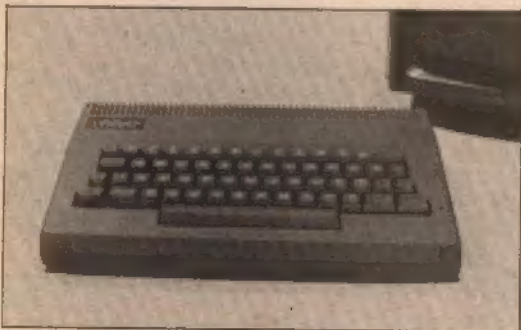
98K**Lynx**

Continued from page 1

The drive comes with its own Lynx operating system. The single disc unit plus operating system and controller card will cost £343.85. Subsequent drives — up to three more can be connected — will not require further controller cards and will be priced at £228.85.

Neither the present 48K machine or the new 96K model are capable of supporting CP/M. For that the 128K Lynx is required. That machine, together with a CP/M card for the disc drive, is planned for the autumn, price tentatively put at around £440.

Those with either of the two smaller Lynx models will have to buy an up-grade to run CP/M.

**Descent into the valley!**

A ROW has broken out between two software companies, both selling games called *The Valley*.

Magazine publisher Argus Specialist Press is claiming that a program first advertised by



Kayde as *The Valley* — and now called *The Swamp* — is in fact a version of a game published in listing form in the magazine *Computing Today*.

"The Kayde program is definitely a version of the game published in the April 1982 issue for the Pet and TRS-80",

The Lynx is, in theory, infinitely expandable. It incorporates a unique method of switching blocks of 64K Ram, enabling the Z80 processor at the heart of the Lynx to handle more than 64K.

However, whichever model is used, only a portion of the Ram can be addressed by the Lynx Basic. There is only 13.75K Basic Ram available in the 48K machine and 37.5K available in the 96K model.

The screen drive (each pixel on the Lynx screen is dot-addressable in eight colours) take up a further 32K which leaves, in the case of the 48K machine, nothing, and in the case of the 96K model, 24K. This remaining memory on the new model can be used for machine-code storage or to hold another language or operating system loaded from either disc or cassette.

claimed Henry Budgett, Argus' Group Software Editor. Since then Argus' software division had produced versions of the game on cassette for the Pet, Vic, Apple, Atari, BBC, Spectrum and Dragon machines.

Kayde put out its program called *The Valley* for the 16K Vic20 in the summer of 1982 and has followed that with versions for the Oric 48K, Spectrum 48K, New Brain, Dragon 32 and Commodore 64.

Following recent heavy advertising of its *Valley/Swamp* program, Kayde has been contacted by Argus who has asked for the titles to be withdrawn.

Kayde's Dean French, who confirmed that he had received the communication from Argus, said: "Our response is that we will continue to sell the game. It is true that our programmer took the idea for the game from the magazine, but it is entirely our own conversion. We had the game available for the Vic, long before Argus ever did."

"We have every intention of continuing with the program," he added.

Argus' company secretary, Mike McKenna commented

"We have now referred the matter to our legal advisors."

There have been two previous occasions where Argus has argued that the copyright in its *Valley* program has been infringed. In both cases the companies involved have agreed to pay Argus compensation.

The more recent of the two cases concerned the London-based software house Computer Rentals. The program involved, *The Orb*, for the Spectrum, was withdrawn from sale and Computer Rentals paid Argus a "very substantial sum of money".



Clement Chambers of Computer Rentals said: "The Orb was created specially for us. We had never seen a copy of *The Valley* and, as soon as Argus contacted us, we agreed to withdraw our title."

Commodore goes for broke

THE price of the Commodore computer will come down substantially in July.

This will form part of a complete review of Commodore's pricing structure. The Vic20 will stay in its new package together with the data recorder and software at £139.99, but the rest of the range will be repriced.

No details of the new prices are so far available but the cost of the Commodore disc drives and Rom cartridge software will fall in addition to the cost of the Commodore 64.

How far the 64 comes down will depend on how close to the Vic20 price the company can go without affecting sales. The Commodore 64 machine is certainly not selling as well as Commodore would like at its present £345 price.

In the US, the machine sells in a special discount scheme

for \$239 (around £155).

If the 64 comes down anywhere near that price it will put pressure on manufacturers like Dragon and Computers to reduce their prices further.

Electron goes bi-lingual

ACORN now has a version of BBC Forth running on its new Electron machine.

Still in the prototype stage, Electron Forth required almost no modification from the BBC version. So far there is no indication of when the Electron Forth will be available, or how much it will cost.

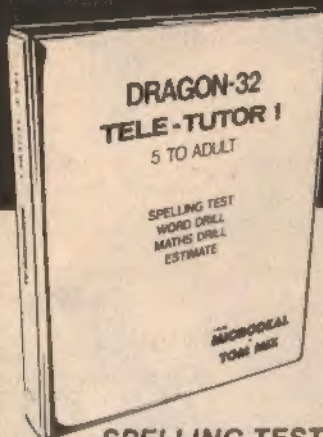
● BBC Forth itself is now on sale. It is available on cassette or disc, priced at £16.85 and £19.90 respectively. A manual is also available — price £7.50. BBC Forth occupies about 11K Ram. This means that you cannot run Modes 0 to 3 on a BBC Model B with Forth. To solve this, Acorn is working on a Rom version, which is now well advanced.

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WORD DRILL

This programme is designed to give a multiple choice vocabulary quiz. Words and their definitions are entered into the programme using the keyboard or from a previously prepared tape file. The computer will then display randomly selected definitions with a choice of eight words. The correct word must be chosen before the preset timer reaches zero. This programme could be used for words and definitions, a geographical quiz, chemical formulae, etc.

Tele-Tutor costs £25 on cassette and is

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- Answers are written as on paper
- Division can be written showing "remainder"
- Ten different skill levels
- "Smiley" face and graphics used as rewards
- Skill levels adjust to ability
- Problems timed
- Correct answers are displayed if error made
- Full report at end of test

ESTIMATE

This programme is designed to help children practice their mental arithmetic. A selection of addition, subtraction, multiplication and division is given.

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- Five skill levels
- Time taken to answer is recorded
- Correct answers are displayed if error made
- Full report at end of test

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LETTERS

A vested interest

Following your editorial concerning Top 10 Charts (12-18 May edition) I really feel you are being incredibly naive in expecting anybody to compile (or believe in) a chart based on manufacturers' actual sales figures. Can you imagine that any of the big software houses would admit that their multi-page, mega-colour advertisements had not each sold a million? Or conversely, after 20 full-colour pages of hype that they have yet to write a program? Manufacturers have a vested interest in promoting their own image and so their figures cannot be relied upon.

For the past year or so the Buffer Shop has had the thankless (and totally unpaid) task of providing the "Sinclair" Top 10 lists to a variety of magazines. The figures are obtained by the simple means of counting the tapes on the shelves each week. Of course our charts are not fully representative because, although we keep a larger range of software for Sinclair micros than anyone else, we stock only the tapes we like or that appear to have some value. We reject those that we consider to be trash, "copy-cats" or that just do not hold our interest, even if they are nationally advertised and stocked by the chain stores.

As with the pop record industry, the most sensible way of judging sales is to average the charts supplied by a number of shops, even though this would mean that the magazines would have to do a little work themselves, for a change. It would also have the beneficial effect that it might relieve us of the stream of attempted bribes, coercions and general incompetence that we fend off every week. On the other hand, how honest can any magazine be when faced with pressure from big, free-spending advertisers? Which magazine will put honesty and integrity before profit and accept advertising only for products which are actually available?

M Howard
Buffer Micro Shop
310 Streatham High Road
London SW16 6HG

If you look closely at our edito-

rial of 12-18 May, you will see that we never expected anyone to compile (or believe in) a chart based on manufacturers' actual sales figures. What the editorial actually said was: "What is needed is an independent chart which accurately reflects the state of the market. But, such a chart could not be compiled by any one magazine, software company or retail chain."

"Ideally, the Computer Trade Association should approach a body such as the British Market Research Bureau and ask it to compile a Top 10 chart."

Since the publication of this editorial we have been in contact with both the CTA, the BMRB and other market research organisations, with a view to compiling just such an independent chart.

Fair play!

With regard to the Softek compiler payments dispute, it should be clear to anyone with a sense of fair play that Softek are wholly justified in demanding royalties on any commercial program which makes use of their compiler. After all, Softek are paying royalties to Sinclair Research for the use made of the Spectrum operating system by Softek programs — aren't they?

Alan Clayton
West View
Blakenhall
Nantwich
Cheshire

Memory gobbler

The letter from C Whitehead (Popular Computing Weekly Vol 2 No 15) made a valid point. However, the suggested improvement to "Board Game" gobbles up more memory, when Run, than the original listing. The problem memory user in the dimensioned array (10 Dim Table (75)). The original handling takes 400 bytes to write, while the suggested improvement takes only 200 bytes to write — but 600 bytes to Run!

I have enclosed an alternative listing for the Inkey\$ handling, which takes only 140

bytes to Run.

```
550 A$=INKEY$:IF
    A$="" THEN550
560 IF A$="X"THEN
    10
570 V=VAL(A$):IF
    V>0 AND V<8 THEN
    C=20*V+5:F1=1
    GOTO 750
580 V=ASC(A$):IF
    V>64 AND V<76
    THEN D=(V-64)*
    20+5:F2=1
```

E Wells
129 St Richards Rd
Deal
Kent CT14 9LD

Not letting on!

I have a tape that my dad bought me. The tape is called Escape. I found out the secret code in 10 minutes — it was the easiest game I have ever had. When I started again, I timed myself — it took me 11.14 seconds to get out. I know the secret code off by heart, but I'm not telling you!

Michael Lunn (10½)
47 Westbury Drive
Macclesfield
Cheshire
SK11 8LJ

The wrong use

I was disappointed to see Chris Seely's Pythagoras program on the Spectrum page of your magazine (PCW, Vol 2 No 17).

I have been following the debate on uses of computers for education quite closely, and I feel that this is the wrong use for them. Any pocket calculator could do what that program does.

So I have enclosed a short program which demonstrates Pythagoras' theorem graphically, which I feel is of more educational value than the one shown.

```
10 PRINT " THIS PROGRAM DEMONSTRATES
    PYTHAGORAS' THEOREM"
20 INPUT "ENTER A SIDE OF A TRIANGLE: ";A
30 INPUT "ENTER ANOTHER SIDE OF A TRIANGLE: ";B
40 C=SQR(A^2+B^2)
50 PRINT "THE HYPOTENUSE IS: ";C
60 END
```

```
100 PRINT AT 3.0: "IF LE ORANGE IS
    HERE A ON THE THIRD SIDE"
110 INPUT "ENTER A SIDE OF A TRIANGLE: ";A
120 INPUT "ENTER ANOTHER SIDE OF A TRIANGLE: ";B
130 C=SQR(A^2+B^2)
140 PRINT "THE HYPOTENUSE IS: ";C
150 END
```

Ian Turton
111 Barden Rd
Tonbridge
Kent

Unnecessary change

Recently the Top 10 list for the Vic20 has had a change of source, from 'The Vic Centre' to 'Boots & Co'. This seems to me an unnecessary and unfair change, since the range of software held by the Vic Centre is far superior to that of Boots. This is from personal experience in trying to find certain products.

The Boots software section consists of Commodore, Bug-Byte, Audiogenic, Imagine and Thorn EMI cassettes and cartridges, whereas the Vic Centre carries all these products and many more including Llamasoft, Rabbit and Interceptor. On many recent occasions, Llamasoft has occupied the top two places and more in your list (on 31 March, five out of the 10 including 1, 2, 3), but since the change in source none of the Llamasoft programs have appeared. Considering the widespread knowledge of Grid Runner, this surprises me.

Surely it is sensible to use a source which bases figures on a wider range of software, such as the Vic Centre?

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Unfortunately, the Vic Centre has closed its retail outlet, hence the switch to Boots. However, we are actively seeking ways of making the Top 10 charts as representative as possible.

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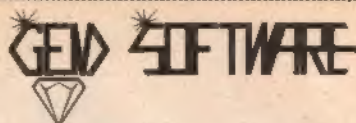
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Muncher

A new game for the 16K ZX81 by S Lancaster

This games program for the 16K ZX81 is called *Muncher*. You control the *Muncher* with the cursor keys, eating the dots and dodging the two ghosts which do their utmost to eat you. This game has an added twist which makes it more difficult, because you cannot go back on the trail of black squares you leave behind.

However, the ghosts leave trails of dots which may let you retrace your path, if you

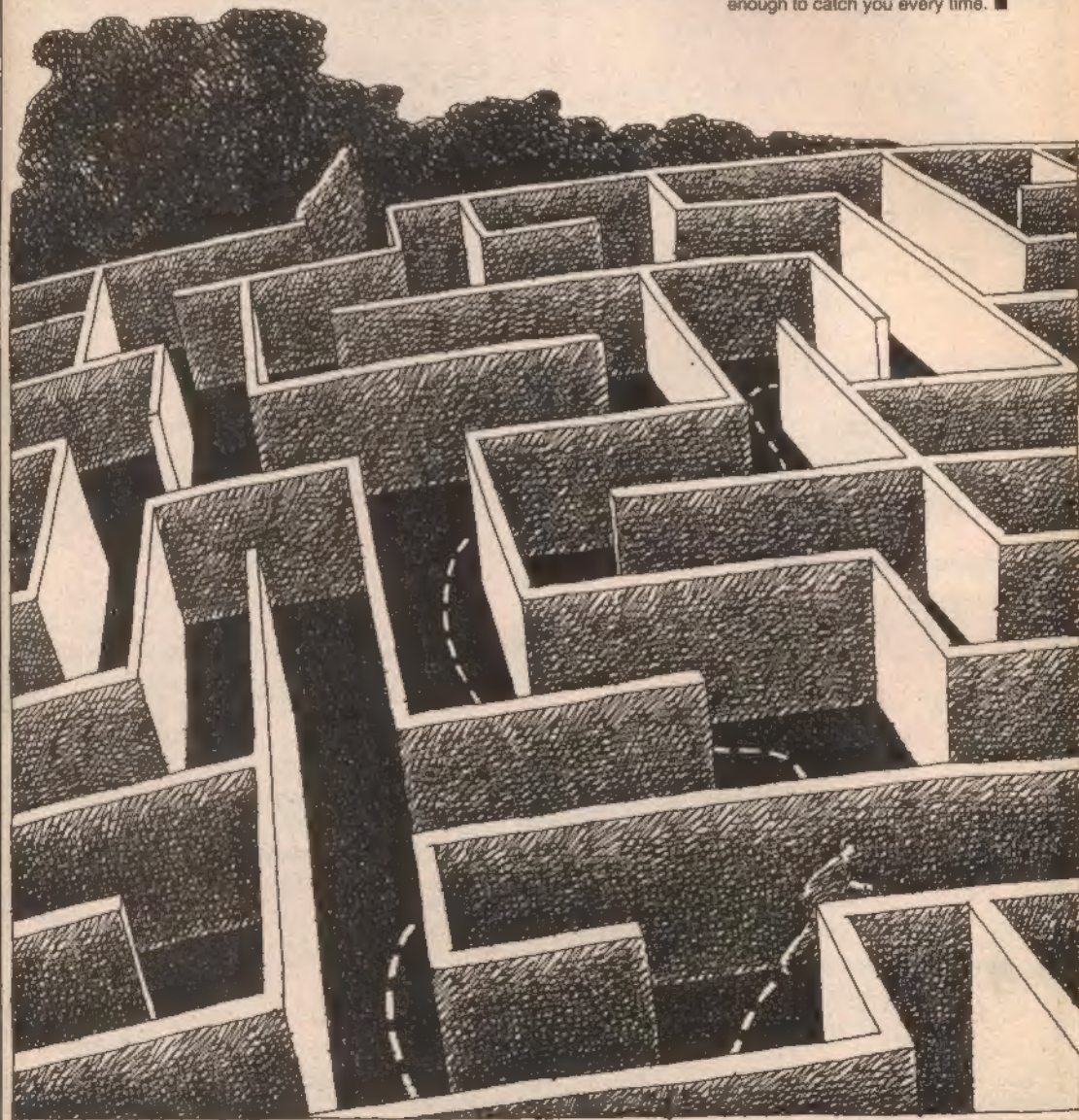
are lucky and you last that long. When you are caught by the ghosts your score — the number of dots you have eaten — is given. The game starts again when any key is pressed.

Lines 10+ set up the maze. Lines 20+ set up the score and the positions of the ghost and the *Muncher*. Lines 50-75 allow the *Muncher* to move through the maze without eating it and to score points.

Lines 80-120 allow the first ghost to

pursue you and 130-170 do the same for the second. Lines 300-305 give the score and reset the game if a key is pressed. Lines 400 and 401 allow the game to run automatically when it is loaded, but this only works if the game is not *Saved* as usual — Run 400 should be entered before recording it.

This game is challenging, but fun to play. It is quite fast even though it is in Basic and the ghosts are intelligent enough to catch you every time. ■




```

10 PRINT AT 0,0:"
11 FOR N=1 TO 10
12 PRINT "
13 NEXT N
14 NEXT N
15 PRINT AT 20,0:"
16 LET S=0
17 LET A=10
18 LET B=15
19 LET X=1
20 LET Y=1
21 LET J=10
22 LET K=20
23 PRINT AT A,B:"":AT X,Y,
24 AT J,K:""
25 LET C=A
26 LET D=B
27 LET H=X
28 LET N=Y
29 LET G=J
30 LET M=K
31 LET A=A+(INKEY$="B")-
32 (INKEY$="7")
33 LET B=B+(INKEY$="8")-
34 (INKEY$="5")
35 PRINT AT A,B:
36 LET P=PEEK (PEEK 16396+
37 256*PEEK 16399)
38 IF P=136 OR P=128 THEN
39 LET A=C
40 IF P=136 OR P=128 THEN
41 LET B=D

```

```

42 IF P=136 THEN LET X=M
43 IF P=136 THEN LET Y=N
44 IF P=48 THEN GOTO 300
45 PRINT AT X,Y,
46 LET L=INT (RND*2)
47 GOTO 132+L
48 LET J=J+SGN (H-X)
49 LET K=K+SGN (B-Y)
50 PRINT AT J,K:
51 LET P=PEEK (PEEK 16396+
52 256*PEEK 16399)
53 IF P=136 THEN LET J=G
54 IF P=136 THEN LET K=M
55 IF P=48 THEN GOTO 300
56 PRINT AT J,K:""
57 GOTO 30
58 PRINT AT 0,11:"SCORE "
59 PRINT AT 20,4:"PRESS ANY
60 KEY TO PLAY"
61 FOR N=1 TO 50
62 NEXT N
63 IF INKEY$="" THEN GOTO
64 305 RUN
65 SAVE "
66 RUN

```


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First of a family!

David Kelly talks to Michael Lunch — new head of Mattel Electronics (UK)

Mattel is one of the world's bigger toy companies. Last year the company — based in Hawthorne, Los Angeles — showed a turn-over of just over \$1.5bn. Like other toy manufacturers, Mattel has had to increase the technical complexity of its products to keep pace with young consumers of ever-increasing sophistication.

In 1979 Mattel announced its first 'electronic' product — the Intellivision video games player system — as a direct competitor to Atari's VCs machine launched a year earlier.

Mattel obviously feels that its push into this new area was worthwhile, because it is now on the point of launching another machine — the Aquarius family computer. The Aquarius and the Intellivision will be handled in this country by a new division set up for the purpose, called Mattel Electronics.

To head up the new company, Mattel has chosen the former managing director of consumer electronics for Texas Instruments (UK), Mike Lunch. And to help establish the Aquarius and extend the market for the Intellivision, it has given him over £5m to spend on promotion.

Mike Lunch is a punctilious 35-year-old with a charming smile. He began his career with an unusual degree — joint honours in Industrial Engineering and Management. He then trained as a chartered engineer, before moving across to marketing with an electronic instruments manufacturer. Next, he became marketing manager of a company that made security systems (radio-controlled door systems 'just like *The Man from U.N.C.L.E.*') and "by an act of fate" he was then made director of engineering!

Hovering on the fence!

He hovered on the fence until 1979 when he jumped in the direction of marketing again. He joined Texas Instruments to launch the TI 99/4 home computer.

The TI computer was one of the first home computers and, for some 18 months, it was only available in the UK in its NTSC form (the American TV system standard). This meant that the computer had to be supplied with a special TV, the whole package costing over £1,000. "We did ourselves a considerable dis-service by test-marketing the NTSC version. As a result, when the PAL UK version appeared it was regarded as an old product and has suffered from this image ever since."

In spring 1980, Mike was promoted to take charge of the full range of TI electronic goods. The PAL version of the 99/4 computer arrived in July 1981, quickly followed by the 99/4A in November.

"Christmas '81 was really a trial market

for us and we sold out — the machine was then in competition with the Atari 400 and the ZX81 — the Vic20 was talked about but didn't arrive."

So TI entered 1982 with a lot of confidence and, in February, Mike was made managing director. In April, however, much of that confidence evaporated with the announcement of the Sinclair Spectrum. "That machine dramatically reduced the price expectation of the consumer. At that stage we were at £299 and we dropped immediately to £199." By this time the Vic had arrived and that also dropped in price, from £199 to £175.

"Still the 99/4A machine didn't sell in the sort of quantities that Texas wanted, so in the autumn we brought it down to £150 — and that worked! That £50 acted like a step function in consumer demand. All the product for the year was sold out within six weeks."

Mike still feels that the 99/4A machine is very underrated: "It had a Sprite capability three years before the Commodore 64. It has 13 digit precision — very accurate for a home computer — and can handle 3-dimensional arrays. That is really a very high spec."

Mike shrugs. The TI 99/4A is no longer his concern. As the newly appointed managing director of Mattel Electronics (UK), his job is to make sure that the new Aquarius home computer sells.

And he seems to have risen to the challenge. Last month, Sinclair cut the price of its 16K Spectrum to under £100. Mattel has responded by fixing the price of the Aquarius at £89.85 — and that is a price that may be discounted still further.

Clearly, the Z80A-based Aquarius is a competitor for the Spectrum, Oric and Vic. "Quite simply, the Aquarius will be the lowest-cost full colour home computer on the market — and what I mean by that is

16 colours, a 40 x 24 character screen with high resolution graphics and a plug-in cartridge capability," says Mike.

And it does not end there. The Aquarius will be launched with a range of software titles, and add-on accessories. A mini-expander adds two extra sound channels, a pair of games controllers and allows two cartridges to be plugged in simultaneously. For example, it is possible to plug in a 16K Ram expansion memory and the *FinForm* spreadsheet cartridge, itself on 20K Rom. There is also an Aquarius 80-character per second 40-column thermal printer and a data recorder.

Early next year there will be a Maxi-Expander unit, allowing the memory to be expanded to 52K and twin disc drives to be connected. The disc drives — also available early in 1984 — will be 5 $\frac{1}{4}$ in and CP/M compatible, making the Aquarius the lowest-priced CP/M machine.

Software-orientated

Mattel, however, remains a software orientated company: "It regards the Aquarius as a machine to run its software," says Mike. "One of the reasons that the Aquarius is so competitively priced is so we can sell our software — but first we must get a broad hardware base."

As Mike says, Mattel is prepared, and will develop software for any machine that has a big enough user base. The company has already announced that it will sell material for the Atari, IBM and Apple machines this year, and the Commodore 64 and Texas machines may follow.

Although Mattel will launch its Intellivision add-on computer keyboard — giving it an extra 32K and Basic programming — this year, most eyes will surely be on the Aquarius, to see if it can compete successfully with the Spectrum.

Says Mike: "We are very serious about the product — otherwise we wouldn't have chosen the £89.85 price point."

"The Aquarius is the first of a family of home computers from Mattel where the emphasis will be on upwards compatibility with future generation products. ■



Keep hitting the keys!

Mike Grace finds out what life is like on the other side of the Traxx

Software for the Vic is definitely getting harder. Let's start with what is (for me) an absolutely impossible game to master — *Traxx* from Llamasoft. This cassette costs £6.00, needs at least 8K expansion, and is infuriating. Why do I say this? Because I cannot do it, that's why.

The game sets up a series of grids on the screen, which you need to colour red by moving the joystick (supposedly moving a spaceship which is all the while being pursued by *Bugs* that will destroy you if they catch you). So by moving your ship along, up, along and down, forming a box, you capture that segment of space. But, it isn't as easy as it sounds, for if you backtrack or move along too far (exceptionally easy with my joystick), then all your hard-earned effort at tracing red in that particular square is lost.

If, by some stroke of luck, you do manage to capture four corner squares, then you can eat a few *Bugs*, instead of them eating you, and score some bonus points. Needless to say, I haven't managed this feat yet. You get a variety of skill levels (81 in all), by varying the speed of play, and the number of nasty bugs chasing you.

I may have made it sound impossibly hard — but this is not so in fact. My own children love it, as do their friends, and I find this game to be a firm favourite amongst the younger generation. I think it's good value for money — exceptional in fact. But it is hard.

Still smarting from the failure to beat *Traxx*, I turned to an adventure game called *Lair* from Soft Toys which costs £6.00 and needs 16K. This is slightly different from the other adventures I've played, as you are given a map of various caves. The idea is to move around the caves (fighting off various baddies along the way) until you eventually find some treasure. Having found it, you must solve a few riddles to enable you to bring the treasure out again.

The game is dotted with Tolkienesque characters (orcs, sprites, balrogs, etc) all wanting to do you harm of some sort or other. But, the orcs carry magic rings which you need to acquire because you cannot get the treasure without at least five rings.

Thus, the main difference between this and other adventures is that you are really trying to find your way around a series of mazes (drawing your own map is essential), and that you don't really ever have to think too hard to solve a problem. All you have to do when faced with a baddy is choose from a selection (a menu, in fact) whether to flee, fight, pass, trade, or

whatever choice you are given.

Despite the lack of original thought, I found the game pretty compulsive, but there are a few nasty surprises. An example of this is the command *Help*, which will tell you where you are in the maze by displaying a map of the level you are on. However, when you press *H* for *Help*, the map is drawn rather quickly on the screen, the symbols are not explained, and before I really had a chance to work out what it all meant, the map had gone again leaving me with 17 fewer points for magic.

... splatted by the wheel of a lorry

Still, *Lair* is an exceptionally good game, quite taxing, and I can see I've got quite a while to go before I solve it, so I'll let you find out more about it yourself.

But, just before I move on to the next cassette, a final few words about the presentation. The game is fairly basic when it comes to packaging (although there is an excellent insert of instructions which explains the principles of playing, helpful to the first-time adventurer). Having a birds-eye view of the tunnels does help as you wander through the maze, but it also tends to stifle creativity as most of the time your journeys through the endless caves are more a question of not getting lost than in working out problems or solving puzzles.

One final feature which is indispensable, you can *Save* your game on tape. This means that as you progress it's possible to *Save* your initial wanderings and just reload, saving a lot of tiresome time should events cause your sudden demise.

After the mind-searching problems of an adventure I settled into another version of *Frogger*, this time from Sumlock Electronic Services, and called *Jumpin' Jack* (interesting how all the different versions of basically the same game come up with a variety of different names, isn't it?). Priced at £7.95 (with 50p postage and packing) for the unexpanded Vic, this cassette is attractively packaged with a full-colour picture of a frog being splatted by the wheel of a lorry (in the best of taste, I can assure you) and contains adequate instructions on the cassette cover.

An interesting sidetrack here is the effort now being made by the software companies to package their products more professionally. When I started these reviews, it seemed only Commodore really troubled to consider the importance of presentation, but now the majority of games are arriving with more care and attention in this aspect of production.

Still, back to *Jumpin' Jack*. The blurb

on the packet tells me that this game is written entirely in fast machine code, with superb sound effects and hi-res graphics (these are not my phrases) so that we have a game with a quality and presentation normally associated with arcade machines. Well, someone should have told them about *Frog Runner* by Anirog (reviewed in *Popular Computing Weekly*, 7-13 April) which costs less and is far superior in every aspect, from the graphics and speed through to the skill required.

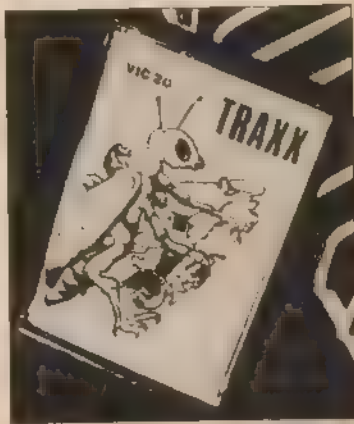
What *Jumpin' Jack* has got is a fairly slow first stage (handy for those who need to build up their skills slowly), which is easy to master. Having manoeuvred the frog across the usual road between the traffic (not hard at all), then you wait until you hop onto the logs and turtles to arrive home. However, once five frogs are home (you have the customary three lives) the game moves up a notch and now there is a row of fast-moving racing cars to dodge plus fewer logs and turtles.

It's quite playable, but it seems a little expensive for what it offers as a competitor in the *Frogger* market.

Staying with Sumlock for the moment, another of its cassettes is *Starship Escape* for the 16K Vic. This is a real-time 'adventure game' which isn't really an adventure game at all, more a test of skill in moving your man about to avoid various hazards.

The idea is that you are a lonely astronaut captured by a mysterious alien craft (a good use of hi-res graphics to display your capture at the start of the game). For some obviously alien reason, the baddies take your spaceship to bits and distribute various parts all over their own ship. They then put you in the airlock and leave you. Your task is to find the various bits of your own craft, carry them back to the airlock, and then reassemble them.

The only problem is that over the ship are various alien baddies (varying in speed and hi-res from spiders and androids to a mysterious alien cloud), whose only goal in life seems to be to pick you up and deposit you back in the airlock. Quite why they have this hang-up about the airlock is never revealed (alien minds are hard to





fathom, I suppose). I found the idea appealing (especially the fact I could stop the clock if I wanted by pressing a and look at a map of the ship to see where I was), but there seemed to be several problems when I got around playing it.

One example was that whenever I pressed the Fire button on the joystick to destroy the baddy — nothing happened. As a consequence I was hauled back to the airlock (fairly annoying if you have managed to dodge about 10 aliens successfully and really seem to be getting somewhere at last) and had to start all over again.

The graphics are reasonable (I especially liked my little astronaut who had a cute habit of waving his arms around like mad as he ran about the ship trying to find the right part) and as I said I like the concept, but I found the game impossible to play because of the fact I could not fire my laser, nor could I pick up parts of the ship when I came them (which should have been possible by pressing the key J). Whether this is just a fault in my review copy or whether a fault in my Vic I'm not sure, but anyway it detracted from the enjoyment. This game is priced at £9.95 and is a reasonable price for what it offers.

For sheer joy it's hard to beat!

Let's stay with the space scene for the next cassette, *Star Warp II* for the expanded Vic (16K) from Soft Toys and priced at £7.00. Like their other 16K game *The Lair*, this is exceptional value for money. The best way of describing this game is to say it is a blend of *Subspace Striker* and *Star Trek*. And the combination works exceptionally well, for we have the skill and interest of *Star Trek* with the graphics and battle skills of *Subspace Striker*.

Although I've liked *Star Trek* before, I have felt something to be missing — and now I know what it was. With *Star Warp II* you are the commander of a space ship (you are given the choice of the beginning of choosing one of six different types, all with varying values for crew, torpedoes, combat, etc, which enables you to try and select a good ship) and you have to jet around the galaxy investigating planets on your way. You have the unusual star

bases to replenish your stocks, but unlike *Star Trek* you also have to warp over to planets and land on them, as part of your mission. Whereas in *Star Trek* your mission is to seek out and destroy the Klingons, in *Star Warp II* the baddies seek you out whilst you are exploring.

It is in the battle sequences that it starts to get exciting. A ship will appear out of nowhere, displayed on the screen, and with exotic names like a Kougan Whip Wing or an Indrot Haeli Dart, and you enter real time for battle. You are given only seconds to decide whether you want to fire torpedoes (by pressing the key T) or phasers (by pressing P) or retreat (by pressing R) and so on. If you don't press you suffer the consequences of enemy fire.

The scope of *Star Warp II* is vast. There are 45 sections to the galaxy. Each section can contain anything from two to five stars and each star can have several planets for you to explore. If you survive all the hazards, you can refuel and take on new crew at the star bases dotted around and, if you come across a star gate, you can warp onto another sector of space.

Star Warp II is excellent value and terrific fun. I can recommend this game for the long winter evenings, providing you like the *Star Trek* concept. Soft Toys seem to be giving good value for money, so it was with a little less apprehension than usual that I turned to the last cassette this time around — a compendium from Soft Toys called *Soft Toys 1* and mainly for the unexpanded Vic. This cassette costs £5.00 and contains seven games in all — must be good value even if some of them (as they so often are) aren't too good.

This cassette is a mix of the general type of games found on 'multiple game' packages. First is *The Deep*, a simple firing game where you are a submarine lying on the sea bed, firing torpedoes at passing ships above you to sink them. Not too difficult (an excellent game for the 5-10 year age group), but the graphics are really something! The submarine looks like a real submarine, the passing ships are of varying shapes and colours, and when

they are hit a short display of a sunken ship appears briefly. The whole presentation is excellent, although the game itself somewhat limiting.

Next is *Killer Park*, needing 3K extra expansion, and what a game this one is — I think of all the games I've played for quite a while this one is the most enjoyable! One seventh of a cheap tape and it gives me more pure fun and enjoyment than all the cartridges and 16K tapes I've reviewed for quite a while. Of course, it hasn't the depth of some of the more expensive games, but for sheer joy it's hard to beat.

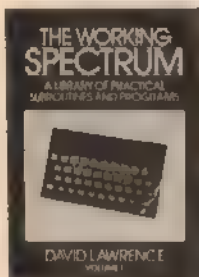
The essence of the game is simple (aren't the good ones always?), you have to get a little man along a maze to the end. But the problem comes in that as you move him you suddenly and without warning have to take part in another game thrown in at random. This can be asteroids, rhino, laser rays dropping from the sky, gobblers; in fact, one of an assortment of very simple and compulsive classics of the micro game stable. Needless to say, if you lose you're taken back to the start.

The rest of the tape contains a version of *Master Mind* called *Code Breaker*, *Noughts and Crosses*, *Music Generator*, *Pontoon*, and *King John* (where you have to estimate the number of tons of corn to plant, eat or feed to the animals to ensure economic survival). This really is an excellent tape, quite a lot of thought has gone into the graphics and presentation of the individual games, and it's well worth the price. In fact, Soft Toys has impressed me with its offerings, and its interesting to note that the only advertisement I've seen for its products (in *Vic Computing*) looked very amateurish and gives no hint of the excellence of its products.

So we're finished with another review. I still cannot do *Traxx*, yet it's the favourite of the bunch for my children (aged 13, nine and five). I'm finding it hard to beat the rhino in the *Killer Park* game on *Soft Toys 1*, and the thought of working through 45 sectors of space in *Star Warp II* is formidable (thank heaven it has a save to tape facility). But, despite all that, I still find computer games addictive, infuriating, and plain, simple fun. I sometimes wonder what it is about them that is so captivating, but that's another symptom of age — what we really need to do is just sit down and enjoy them. So, whatever your age out there, keep hitting the keys and moving the joysticks (ouch!).

| Firm | Program | Price | Value (1-10) |
|---|--|------------------------------|--------------|
| Liamasoft 49 Mount Pleasant Tadley Hants RG26 6BN | <i>Traxx</i> | £6.00 | 8 |
| Sumlock Royal London House 198 Deansgate Manchester M3 3NE | <i>Jumpin' Jack</i> <i>Starship Escape</i> | £7.95 (+p&p) £9.95 (+p&p) | 5 6 |
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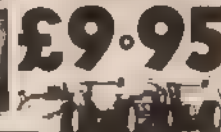
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Speaks for itself!

Mark Martin sounds off about an illustrative program for the Vic20

'Speaking of' is a quick and easy way to make communication with the user more interesting, especially in a program, like an adventure, where many comments or messages need to be printed on the screen. It takes up little memory space, just over one kilobyte, and does not *Poke* the screen so it will work on unexpanded or expanded Vic20 machines.

The program proper starts at line 60000 onwards, so it should fit in your program quite happily without interfering with other routines. However, care is needed to ensure that the variables used in the routine are not repeated within the main program.

To make the routine work, assign X\$

with a sentence and *Gosub* 60000 (lines 10 to 30 give an example of this and may be deleted if necessary). Each word must be separated by a space (not a shifted space) to make this work and punctuation must be followed by a space.

One of the major features of this routine is that a *Bleep* is sounded for each syllable. This is far easier than most people think, if you break down a word. For example, take the word *Program*. It has two syllables thus:

PRO-GRAM

Each syllable in the word *Program* has one vowel within it. But, how about the word *Routine*? This is separated as follows:

ROUTINE

The first syllable has two vowels which are joined in a group. As a general rule, each syllable has a vowel or a group of vowels. By producing a *Bleep* for each vowel or group of vowels the effect of sounding out each syllable is created.

Program notes

60000-60090 SEARCH X\$ FOR WORD
60100-60310 PRINT HEAD
60320-60440 PRINT WORD AND CHECK FOR VOWELS
60410-60520 PRONOUNCE VOWELS

Variables

M\$ = POSITION CURSOR AT MOUTH
M2\$ = POSITION CURSOR AND CLEAR LINE
X\$ = MESSAGE TO BE PRINTED
WD\$ = WORD FROM X\$
ZZ\$ = CHARACTER FROM WD\$
NX\$ = NEXT CHARACTER FROM WD\$
SR\$ = CHARACTER FROM X\$
PO = LAST POSITION OF CURSOR
NT = NOTE TO BE PLAYED
DE = DELAY

5 REM BY MARK MARTIN

10 X\$="THIS IS AN EXAMPLE OF THE PROGRAM
'SPEAKING OF' FOR THE VIC"

20 GOSUB60000

30 END

60000 M1\$="XXXXXXXXXXXXXXXXX"

60010 M2\$=M1\$+"XXXXXXXXXXXXXXXXX"

60020 PRINT"J"

60030 PS=0:PRINTM1\$;PO=POS(0)

60040 WD\$=""

60050 PS=PS+1:SR\$=MID\$(X\$,PS,1):
WD\$=WD\$+SR\$

60060 IFPS>LEN(X\$)+1THENPRINT"XXXXX"
:RETURN

60070 IFSR\$<>" "ANDSR\$<>" "THEN60050

60080 IFPO+LEN(WD\$)<21THENGOSUB60320:
GOTO60040

60090 PRINTM2\$;PO=POS(0):GOSUB60320:
GOTO60040

60100 PRINT"X" " "

60110 PRINT"X" " "

60120 PRINT"X" " "

60130 PRINT"X" " "

60140 PRINT"X" " "

60150 PRINT"X" " "

60160 PRINT"X" " "

60170 PRINT"X" " "

60180 PRINT"X" " "

60190 POKE36876,0:POKE36876,0

60200 RETURN

60210 PRINT"X" " "

60220 PRINT"X" " "

60230 PRINT"X" " "

60240 PRINT"X" " "

60250 PRINT"X" " "

60260 PRINT"X" " "

60270 PRINT"X" " "

60280 PRINT"X" " "

60290 PRINT"X" " "

60300 POKE36876,15:POKE36876,NT.

60310 RETURN

60320 GOSUB60100

60330 FORLN=1TOLEN(WD\$)

60340 ZZ\$=MID\$(WD\$,LN,1)

60350 NX\$=MID\$(WD\$,LN+1,1)

60360 IFZZ\$="A"ORZZ\$="E"ORZZ\$="I"ORZZ\$="O"
ORZZ\$="U"ORZZ\$="Y"THENGOSUB
60410

60370 PRINTM1\$;TAB(PO);ZZ\$;PO=POS(0)

60380 NEXT

60390 POKE36876,0:POKE36876,0

60400 RETURN

60410 IFNX\$="A"ORNX\$="E"ORNX\$="I"ORNX\$="O"
ORNX\$="U"ORNX\$="Y"THENRETURN

60420 IF(NX\$=" "ANDZZ\$="E"ANDLEN(WD\$)>4)
THENRETURN

60430 IFZZ\$="A"THENNT=180:DE=200

60440 IFZZ\$="E"THENNT=195:DE=150

60450 IFZZ\$="I"THENNT=210:DE=100

60460 IFZZ\$="O"THENNT=200:DE=250

60470 IFZZ\$="U"THENNT=180:DE=250

60480 IFZZ\$="Y"THENNT=185:DE=200

60490 GOSUB60210

60500 FORK=1TODE:NEXT

60510 GOSUB60100

60520 RETURN

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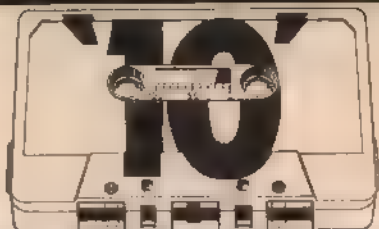
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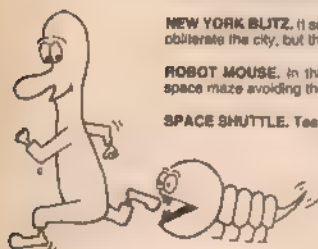
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Paint it black!

Ian Logan presents a series of routines to 'paint' triangles, rectangles and circles

This article contains a series of Basic programs that explore the 'filling-in' of triangles, rectangles and circles. These programs will be of greatest interest to Spectrum owners but, nevertheless, owners of other microcomputers should find much of interest.

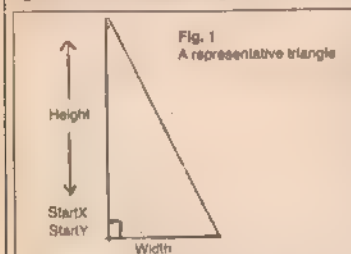
The Spectrum has three commands that can be used to outline a figure:

PLOT x,y -sets a pixel at position x,y
DRAW x,y -sets a line of pixels from the 'last position' to a point x,y distant (The **DRAW x,y,z** command that draws curved lines was discussed in PCW, 12-18 May).

CIRCLE x,y,z -draws a circle with centre x,y and radius z.

There are, however, no commands for 'filling-in' areas and such actions have to be programmed — either in Basic or machine code.

First the assumptions. Figure 1 shows a representative triangle. It has an origin, **StartX**, **StartY**, a height and a width. The triangle is right-angled and is formed to the right-hand side of the Height.



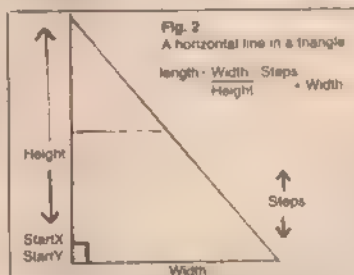
There are several ways in which all the pixels lying within the area of the triangle

can be set. The idea of considering all pixels and **Plotting** only those that occur in the triangle is a non-starter, as is the approach of **Drawing** lines radially — very pretty but rather slow.

A better way is to construct the triangle from a series of horizontally **Drawn** lines. The **Drawing** of a line is reasonably fast in the Spectrum and the set of horizontal lines includes all the necessary pixels. The length of a horizontal line is given by the formula:

$\text{Width} - \text{Steps} \cdot \text{Height} \div \text{Width}$

where **Steps** is the required line number, with the line through the origin being **Step zero**. Figure 2 shows this stage of the discussion.



The 'Filled-in Triangles' program shows the finished algorithm. The program allows for triangles to be **Drawn** in any quadrant. Note that the top line, a single pixel, is best considered by itself — and, as written, all triangles are of the same colour.

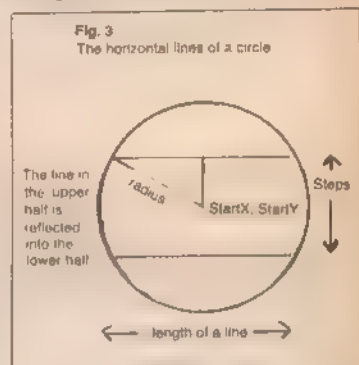
It is, in fact, easier to fill-in rectangular areas than to fill-in triangles, as the line length will be constant. Again, the origin of the rectangle is taken as **StartX**, **StartY**;

and the rectangle has both **Width** and **Height**.

The **Filled-in Rectangles** program shows the full algorithm. This time the figures come in random colours and the user is repeatedly prompted to enter the next rectangle. Care must be taken to ensure that the parameters entered are valid, otherwise the program will stop (see the section on 'error trapping').

The filling-in of circular areas gives the programmer the chance to develop rather more complicated algorithms. A circle has an origin, **StartX**, **StartY**; and a radius. But, there are then many ways in which the lines of the areas can be described.

In the accompanying algorithm the 'length of a line' is found by using simple Pythagorean arithmetic. Then, to save the repeated evaluation of line lengths, the line from the upper semi-circle is reflected to the lower semicircle. Figure 3 illustrates the algorithm.



The **Filled-in circles** program shows the complete algorithm. In the program it is the 'square of the radius', **Rad2**, that has to be available throughout. Also note the use of the expression:
 $\text{EXP}(1/2 \cdot \text{LN}(\text{RAD2} \cdot \text{Steps} \div \text{Steps}))$
 as this explains more fully how the Spec-

```

10 REM FILLED-IN TRIANGLES
20 INPUT "Enter start (X & Y)"; StartX, StartY
30 INPUT "Enter width and height"; Width, Height
40 LET Steps=Height
50 PLOT StartX, StartY+Steps
60 GO TO 100
70 REM The loop for the lines
80 PLOT StartX, StartY+Steps
90 DRAW Width-Steps/Height*Width, 0
100 IF NOT Steps THEN STOP
110 LET Steps=Steps-(Steps>0)+(Steps<0)
120 GO TO 80
  
```

```

10 REM FILLED-IN RECTANGLES
20 INPUT "Enter start (X & Y)"; StartX, StartY
30 INPUT "Enter width and height"; Width, Height
40 LET Steps=Height
50 LET Col=AND%8.5
60 REM The loop for the lines
70 PLOT INK Col; StartX, StartY+Steps
80 DRAW INK Col; Width, 0
90 IF NOT Steps THEN GO TO 20
100 LET Steps=Steps-(Steps>0)+(Steps<0)
120 GO TO 70
  
```

trum evaluates its square roots.

Once again, the user can make the figures appear in different colours, or with random sizes.

Everyone who has used *Plot*, *Draw* or *Circle* on a Spectrum will have found that an 'error report' is given, and the program stops, whenever the edge of the tv screen is reached. It is, however, possible to trap this situation by altering the system variable *Err-Sp* and thereby continue with the program.

The system variable *Err-Sp* is the pointer to the return address 1303h that, if

acted upon, returns the interpreter to the main execution loop and produces an 'error report'. The address on the machine stack below the 1303h (ie, added later) is the address *Stmt-Ref*, 1876h, that always leads to the next statement being considered by the operating system.

In the case of an error occurring that the user wishes to trap, then it is a straightforward matter to surround the error-giving statement with the necessary statements to change the value of *Err-Sp* (*Err-Nr* needs resetting also as 'no error' has occurred). The program *Showing Err-Sp*

illustrates these addresses on the machine stack.

As a suggested protocol, the program *Error Trapping* gives the necessary steps. The flag, *F*, becomes set only when an 'error' has been trapped.

This article has tried to give the reader a few ideas that can be developed. The *Finale* program has been written, not to develop any new material, but only to consolidate the concepts that have been mentioned. The *Finale* program is a 'sit & watch' program and I hope that you like it — please find yourself a colour tv for it! ■

```
10 REM FILLER-IN CIRCLES
20 INPUT "Enter centre (X & Y) "; StartX; " "; StartY
30 INPUT "Enter the radius "; Steps
40 LET Steps=ABS INT Steps
50 IF NOT Steps THEN STOP
60 LET RAD2=Steps*Steps
70 REM The loop for the lines
80 LET Steps=Steps-1
90 IF Steps<0 THEN STOP
100 LET XL=EXP (1/2*LN (RAD2-Steps*Steps))-1
110 LET Line=XL+XL
120 LET StartL=StartX-XL
130 IF StartL<0 THEN LET Line=Line+StartL: LET StartL=0
140 REM Draw an upper halfline
150 PLOT StartL, StartY+Steps: DRAW Line,0
160 REM Draw a lower half line
170 IF StartY-Steps<0 THEN GO TO 80
180 PLOT StartL, StartY-Steps: DRAW Line,0
190 GO TO 80
```

```
10 REM ERROR TRAPPING
20 POKE 23613,PEEK 23613-2
30 DRAW 300,0
40 LET F=0: IF PEEK 23610<>255 THEN LET F=1
50 POKE 23610,255: POKE 23613,PEEK 23613+2
60 PRINT "Error trapped successfully" AND F,"No error" AND NOT F
```

```
10 REM SHOWING ERR_SP
20 LET ERRSP=PEEK 23613+256*PEEK 23614
30 FOR a=ERRSP+1 TO ERRSP-2 STEP -1
40 PRINT a,PEEK a
50 NEXT a
```

```
10 REM FINALE...
20 LET StartX=8*INT (RND*25)
30 LET StartY=8*INT (RND*18)
40 LET Steps=7*8*INT (RND*10)
50 LET Width=7*8*INT (1+RND*15)
60 LET Col=INT (RND*8)
70 POKE 23613,PEEK 23613-2
80 PLOT INK Col,StartX,StartY+Steps
90 LET F=0: IF PEEK 23610<>255 THEN LET F=1
100 POKE 23610,255: POKE 23613,PEEK 23613+2
110 IF F THEN GO TO 20
120 POKE 23613,PEEK 23613-2
130 DRAW INK Col,Width,0
140 POKE 23610,255: POKE 23613,PEEK 23613+2
150 IF Steps<1 THEN GO TO 20
160 LET Steps=Steps-1
170 GO TO 70
```


Shifting sands . . .

Peter Chase presents a series of machine code scrolling routines

This is the last in my series on machine code for the Dragon — it deals with scrolling and shifting blocks of memory. All the routines can be used by Basic or assembly language programs.

Listing One contains three routines that can perform most shifts and scrolls. @UL shifts a block of memory Length*2 bytes long that starts at From to the block starting at To. As it starts shifting at the lowest address (From) it is used to scroll either left or up.

@DR shifts a block of memory Length*2 bytes long that ends at From to the block ending at To. It shifts from the highest address and is used to scroll right or down.

@BLANK is not a shift routine. It stores the byte in CHARACTER in COLUMNS separate addresses starting at FIRST with a gap between addresses GAP. It has a number of uses, including clearing small areas of screen, cleaning memory and, most importantly, stopping wrap around in horizontal scrolls (wrap around is the effect when the far edge of the screen appears on the other side after scrolling).

All the variables I have mentioned (in capitals so far) are stored in addresses

&H7FF0 to &H7FFB. By altering these, most scrolls can be performed. Table one gives examples of suitable values to assign to the variables while Listing Two shows how to enter the values in a Basic program to produce, for example, upward text scrolling.

Listing Three is a very simple demonstration game, using one scrolling routine and the @Blank routine. You use the up and down arrow keys to avoid the advancing coloured blocks. Such a game should be written in machine code, to match the speed of the scrolling routine, but Basic is used here for conciseness.

Notice that the game displays 10 colours on the screen at once, not the claimed nine. In fact, the Dragon has 12 colours (the extras are light orange, dark red and deep green) and 11 can be displayed at one time on a text or mode 24 screen without using machine code.

TABLE ONE

| SCROLL | LENGTH &H7FF0 | FROM &H7FF2 | TO &H7FF4 | FIRST &H7FF6 | CHARACTER &H7FF8 | GAP &H7FF9 | COLUMNS &H7FFA | EXEC |
|-----------------|------------------|----------------|--------------|-----------------|---------------------|---------------|-------------------|--------------------|
| Text Up | 0 240 | 4 32 | 4 0 | | | | | in UL only |
| Text Down | 0 240 | 5 223 | 5 255 | | | | | in DR only |
| Text Left | 1 0 4 | 1 4 | 4 0 | 4 31 | 32* | 32 | 0 16 | in UL (+ in BLANK) |
| Text Right | 1 0 5 | 254 5 | 255 0 | 4 0 | 32* | 32 | 0 16 | in DR (+ in BLANK) |
| PMODE 0 — Up | 2 240 | 6 16 | 6 0 | | | | | in UL only |
| PMODE 0 — Down | 2 240 | 11 230 | 11 255 | | | | | in DR only |
| PMODE 1 or 2 UP | 5 240 | 6 32 | 6 0 | | | | | in UL only |
| etc | | | | | | | | |

All values decimal unless stated otherwise
*Or other appropriate character

Listing One—Memory Shift(scroll)Routines

```

7000 FCFF0 50 PRT
7001 100E7FF2 50 BUL LDD 07FF0
7002 FE7FF4 50 LDD 07FF4
7003 4C 50 INCA
7004 A0A1 50 BSHIFTL LDX ,*+
7005 AFC1 50 STX ,U+
7006 3A 50 DECA
7007 20F3 50 BNE BSHIFTL
7008 1A 50 DECA
7009 20F8 50 BNE BSHIFTL
7010 33 50 RTS
7011 FCFFB 50 BUL LDD 07FF0
7012 100E7FF2 50 LDD 07FF4
7013 FE7FF4 50 INCA
7014 4C 50 BSHIFTL LDX ,*+
7015 A0A1 50 STX ,U+
7016 AFC3 50 DECA
7017 20F3 50 BNE BSHIFTL
7018 1A 50 DECA
7019 20F8 50 BNE BSHIFTL
7020 33 50 RTS
7021 100E7FFB 50 BUL LDD 07FF0
7022 FCFFB 50 LDD 07FF4
7023 100E7FFA 50 BUL STA ,*
7024 A7B4 50 BND
7025 3A 50 LEAY ,*+
7026 31A2 50 BNE BND
7027 20F3 50 BNE BND
7028 33 50 RTS
7029 33 50 BND BSHIFTL

```

Listing Two

```

20 CLEAR200,&H0FFF
30 I=&H0FFF
40 I=I+1:READA:=IF A<0:"Z"THENPOKEI,VAL(
  "Z"+A):GOTO40
50 DATAFC,2F,F0,10,BE,2F,F2,FE,2F,F4,4C,
  AE,A1,AF,C1,5A,26,F9,4A,26,F8,39,FC,2F,F
  0,10,BE,2F,F2,FE,2F,F4,4C,AE,A3,AF,C3,5A
  ,26,F9,4A,26,F8,39,BE,2F,F8,FC,2F,F0,10,
  BE,2F,FA,A7,84,3A,31,A2,26,F9,39,2
110 FORI=&H7FF0 TO&H7FFB:READA:POKEI,A:N
EXT
120 DATA0,240,4,32,4,00
130 FORI=10100:EXEC&H7000:NEXT
140 PRINT"SCROLLING":GOTO130

```

Listing Three

```

10 POKE65494,0
20 CLEAR200,&H0FFF
30 I=&H0FFF
40 I=I+1:READA:=IF A<0:"Z"THENPOKEI,
  VAL("Z"+A):GOTO40
50 DATAFC,2F,F0,10,BE,2F,F2,FE,2F,
  F4,4C,AE,A1,AF,C1,5A,26,F9,4A,
  26,F8,39,FC,2F,F0,10,BE,2F,F2,
  FE,2F,F4,4C,AE,A3,AF,C3,5A,26,
  F9,4A,26,F8,39,BE,2F,F8,FC,2F,
  F0,10,BE,2F,FA,A7,84,3A,31,A2,
  26,F9,39,2
110 FORI=&H7FF0 TO&H7FFB:READA:
  POKEI,A:NEXT
120 DATA1,240,4,1,4,0,4,31,32,
  32,0,17
130 FORI=10100:EXEC&H7000:
  EXEC&H702C:NE
  XT:POKE65495,0
140 P=1056
150 SCREEN0,1
160 EXEC&H7000
170 POKEP,159:POKEP-32,153:
  POKEP+32,150
180 EXEC&H702C
190 IFPEEK(P+1)>128ORPEEK(P-31)>
  128ORPEEK(P+33)>128THENCLS:
  POKE65494,0:ENJ
200 K=INKEY$:P=P-32:(P(1470ANDK=
  0))+32*(P(1056ANDK= CHR$(1)
  CHR$(34))
210 S=S+1:IFRND(1000)>S THEN230
220 POKE1055+32*RND(15),127+RND(0)
  *16
230 POKEP,32:POKEP-32,32:POKEP+32,
  32:GOTO160

```


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Turning turtle . . .

Boris Allan looks at the ins and outs of turtle graphics

Turtle graphics have a long history in mathematics (in the guise of polar geometry and vector algebra), but have been developed as a programming tool and teaching aid by Seymour Papert and co-workers at Massachusetts Institute of Technology.

These routines can be used by pupils to investigate vector/polar geometry, but will probably find greatest use as the basis of systems which are rather more user-friendly. The language Logo (of increasing prominence in primary education) uses a special version of turtle graphics and can be connected to a robotic turtle — it is not difficult to use my *Turgra* routines as the basis for a Logo-type emulator in BBC Basic. As the UCSD Pascal system also uses turtle graphics, but non-interactively, I have given equivalents of all the UCSD commands (plus certain others). *Turgra* however, can be used interactively.

The "Turtle" in turtle graphics is an imaginary beastie which faces in a certain direction (*Angle* in the program). It has certain co-ordinates (*X* and *Y*), and drags a pen which can either be up or down (eg. *Move* or *Draw*). The Turtle starts at the centre, facing up the display screen. In program order the routines are:

+ *Proclscr* which clears the graphic screen and the text screen.

+ *Procclg* sets the graphics foreground,

and background, colours (*Pen* is normally 0). The graphics screen is set to leave a space at the bottom (*Vdu* 24), the screen is cleared (*CLG*), and the origin is set at the centre (*Vdu* 25).

+ *Proccls* sets the text colours (to the reverse of the graphics colours), sets the text screen to four lines at the bottom, and clears the new text screen.

+ *Proccol* is a procedure which allows the user to set the colour of the Turtle's pen (0 is black, and 1 is white), though this is rarely used by the user.

+ *Proccentre* resets the Turtle to the centre, facing upwards.

+ *Proccstart* clears the graphics, and re-centres, without affecting the text space.

+ *Proccstart* uses *Pencol* to set the pen colour to black, clears both the graphics screen and the text screen, and re-centres.

+ *Procinvert* changes the pen colour from black to white (and vice versa), without changing the graphics background — this is used for drawing over previous lines.

+ *Procturn* turns the Turtle through *A* degrees, where a positive value is counter-clockwise, and a negative value is clockwise, and the resulting direction (always between 0 and 359) is saved as *Angle*.

+ *Procturn* turns the Turtle to that angle (again normalised by *Fangle*).

+ *Procloc* is an environmental enquiry which gives the user the co-ordinates and orientation of the Turtle.

+ *Procmove* moves the Turtle forward by *Distance* in the present direction. Whether the pen draws or not is set by *Style* — if *Style* is 1 then the line is drawn, otherwise the pen is moved without drawing.

+ *Procmoveto* is a move to a specified pair of co-ordinates, also finding the required angle.

+ *Fangle* takes an input and returns a value between 0 and 359.

+ *Procnw* clears the screen, by re-setting the cursor and clearing the screen.

The routines are designed to be used in *Mode 4*, so before using the routines the mode needs setting (eg. by typing in *Mode 4* in instant mode).

It is worth experimenting with the procedures to get a feel for them. A good one to try is:

```
PROCSTART PROCMOVE(200,1)
PROCTURN(90): PROCMOVE(200,1)
PROCTURN(90): PROCMOVE(200,1)
PROCTURN(90): PROCMOVE(200,1)
```

and various other little exercises. It is also easy to produce a procedure to draw a square:

```
3040 DEF PROC SQUARE(S)
3010 LOCAL I, FOR I=1 TO 4
3020 PROCMOVE(S,1): PROCTURN(90)
3030 NEXT I
3040 ENDPROC: REM SQUARE
```

and to produce squares of different sizes. Try some random values and turns, eg:

```
4000 DEF PROC CIRCLE
4010 LOCAL I, FOR I=1 TO 360
4020 PROCMOVE(5,1): PROCTURN(1)
4030 NEXT I: ENDPROC: REM CIRCLE
```

```
1000REM-----
1010REM-----
1020REM-----
1030REM-----
1040REM TURTLE-GRAPHICS ROUTINES
1050REM-----
1060REM-----
1070REM (c) BORIS ALLAN, 1983
1080REM-----
1090REM-----
1100REM-----
1110REM-----
1120REM-----
1130DEF PROC CLRSCR
1140PROCCLS: PROCCLG
1150ENDPROC: REM CLRSCR
1160REM-----
1170REM-----
1180DEF PROCCLG
1190GCOL0, PEN:GCOL0, 129-PEN
1200VDU24, 0; 128; 1279; 1023;
1210CLG
1220VDU29, 640; 566;
1230ENDPROC: REM CLG
1240REM-----
1250REM-----
```

```
1260DEF PROCCLS
1270COLOUR 1-PEN: COLOUR128-PEN
1280VDU28, 0, 31, 39, 28:CLS
1290ENDPROC: REM CLS
1300REM-----
1310REM-----
1320DEF PROCCOL(PEN)
1330PEN=PE
1340ENDPROC: REM COL
1350REM-----
1360REM-----
1370DEF PROCCENTRE
1380MOVE0, 0: ANGLE=0: X=0: Y=0
1390ENDPROC: REM CENTRE
1400REM-----
1410REM-----
1420DEF PROC RESTART
1430PROCCLG: PROCCENTRE
1440ENDPROC: REM RESTART
1450REM-----
1460REM-----
1470DEF PROC START
1480PROCCOL(0): PROCCLRSCR:
PROCCENTRE
1490ENDPROC: REM START
1500REM-----
```

Continued on page 27

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```

1510REM-----
1520DEF PROCINVERT
1530PEN=1 : PEN: GCOL 0, PEN
1540ENDPROC : REM INVERT
1550REM-----
1560REM-----
1570DEF PROCTURN(A)
1580ANGLE=FNANGLE(ANGLE+A)
1590ENDPROC : REM TURN
1600REM-----
1610REM-----
1620DEF PROCTURNT0(A)
1630ANGLE = FNANGLE(A)
1640ENDPROC : REM TURNT0
1650REM-----
1660REM-----
1670DEF PROCLOC
1680PRINT "COORDINATES ARE ";X,Y
1690ENDPROC : REM LOC
1700REM-----
1710REM-----
1720DEF PROCMOVE(DISTANCE,STYLE)
1730LOCAL XC,YC
1740XC=DISTANCE*SIN(RAD(ANGLE)):
YC=DISTANCE*COS(RAD(ANGLE))
1750X=X-XC : Y=Y+YC
1760IF STYLE=1 THEN DRAW X,Y ELSE

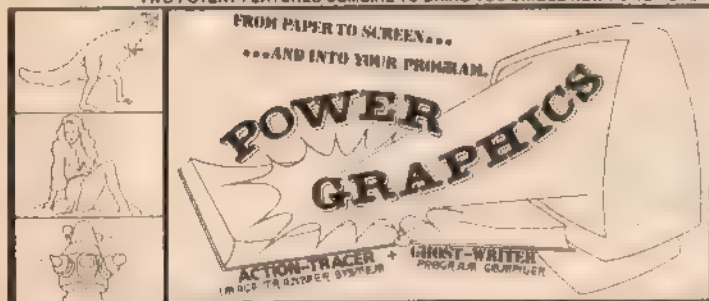
```

```

MOVE X,Y
1770ENDPROC : REM MOVE
1780REM-----
1790REM-----
1800DEF PROCMOVETO(XN,YN,STYLE)
1810LOCALXDIF,YDIF: XDIF=XN-X:
YDIF=YN-YN
1820IF YDIF<>0 THEN PROCTURNT0(DEG(
ATN(XDIF/YDIF)))+180*(YN<Y
)) ELSE PROCTURNT0:SGN(-XDIF)
*90)
1830X=XN : Y=YN
1840IF STYLE=1 THEN DRAW X,Y ELSE
MOVE X,Y
1850ENDPROC : REM MOVETO
1860REM-----
1870REM-----
1880DEF FNANGLE(A)
1890IF A>0 THEN =A MOD 360 ELSE =A
MOD 360 +360 : REM ANGLE
1900REM-----
1910REM-----
1920DEF PROCNEW
1930VDU26:CLS
1940ENDPROC : REM NEW
1950REM-----
1960REM-----

```

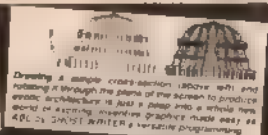
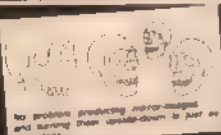
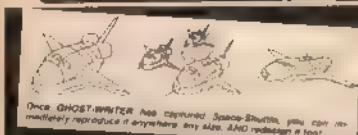
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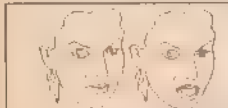
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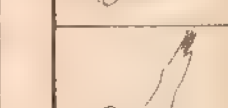


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Open Forum is for you to publish your programs and ideas. Take care that the listings you send in are all bug-free. Your documentation should start with a general description of the program and what it does and then give some detail of how the program is constructed. We will pay the *Program of the Week* double our new fee of £6 for each program published.

Invaders

on Vic20

This is an Invader-type game. Full instructions are included in the program. If it is too hard or too easy then the amount of time

between each jump is easily changed. This is done by changing the number in line 502 (smaller makes it harder and bigger makes it easier). The program uses 95 percent of the memory available on the standard machine and it should be a simple job to convert to joystick.

Program notes

Lines

- 5-160 Give instructions
- 170-235 Set up game
- 240-280 Movement of man + access to bird's movement
- 300-350 Man fires
- 500-540 Move seahawk (left/right)
- 550-570 Move seahawk down
- 600-660 Seahawk fires
- 900-910 Add to score + place new seahawk on the screen
- 1000-1090 User definable graphics
- 2000-2010 Take of life when hit + when no lives left goto the end
- 2020-2150 Finish game + print comment on score + print high score

```

5 PRINT "J" H1=0 Q=0
10 POKE36879,23080126
30 PRINTTAB(7);"SEAHAWK"
40 PRINTTAB(7);"-----"
45 PRINT
50 PRINT "KILL THE SNOOPING SEAHAWK! BUT BE
  WARNED OUT OF ITS DEATHPLACE WILL
60 PRINT "COME ANOTHER."
65 PRINT "X"
70 PRINT "MATCH OUT FOR ITS DD'S (DEADLY DROPPINS)
  GET HIT 3 TIMES AND YOU'RE DEAD!"
75 PRINT
80 PRINT "WHEN IT GETS TO THE BOTTOM YOU'RE
  KILLED AS WELL!"
90 PRINT "HIT ANY KEY I ";
91 POKE198,0 WAIT198,1 POKE198,0
100 PRINT "J"
101 PRINT "YOU DO HAVE ONE THING ON YOUR SIDE YOU
  CAN FIRE BACK AT IT WITH YOUR ARROWS."
102 PRINT "YOU HAVE AN UNLIMITED SUPPLY OF THESE."
103 PRINT PRINT
105 PRINT "THE CONTROLS ARE -"
110 PRINT "F - FIRES THE ARROW"
120 PRINT "M - MOVES TO THE LEFT"
130 PRINT "R - MOVES TO THE RIGHT"
135 PRINT "PLEASE WAIT!!"
140 GOTO1000
150 PRINT "PRESS ANY KEY TO START";
160 POKE198,0 WAIT 198,1 POKE198,0
170 LI=3:SC=0
180 PS=7712 MA=8130
190 PC=38432 MC=38850
195 PRINT "J"
200 POKE36879,25
210 FORI=0T043 POKE8142+I,63 POKE38862+I,3 NEXT
220 POKEPS,59 POKEPS+1,60 POKEPC,2 POKEPC+1,2
230 POKEMA,61 POKEMC,6
235 PRINT "SC:" ".LI
236 POKEMB,32
240 A=PEEK(197)
250 IFA=29THENMA=MA-1 MC=MC-1 POKEMA+1,32 IFMAC=
  8120THENMA=8120 MC=38840
260 IFA=37THENMA=MA+1 MC=MC+1 POKEMA-1,32 IFMAC=
  8141THENMA=8141 MC=38861
265 IFA=42THENGOTO300
270 POKEMA,61 POKEMC,6
275 GOTO500
280 GOTO235
300 M1=MC-22 MB=MA-22
305 M1=M1-22 MB=MB-22
310 POKEMB+22,32 POKEMA,61
320 POKEMB,30 POKEM1,0
330 IFPEEK(MB-22)=59THENGOTO900
340 IFMAC=7724THENGOTO275
350 GOTO305
500 A=INT(RND(1)*2)+1
501 Q=Q+1
502 IFC=10THENQSUB550
510 IFA=1THENPS=PS+1 PC=PC+1 POKEPS-1,32 IFPS=
  7723THENPS=7722 PC=38442
520 IFA=2THENPS=PS-1 PC=PC-1 POKEPS+2,32 IFPS=
  7702THENPS=7703 PC=38423
530 POKEPS,59 POKEPS+1,60 POKEPC,2 POKEPC+1,2
534 B=RND(1)
535 IFB,9THENGOTO600
540 GOTO280
550 Q=0
555 PC=PC+22
560 PS=PS+22 POKEPS-22,32 POKEPS-21,32 POKEPS,59
  POKEPS+1,60
565 POKEPC,2 POKEPC+1,2
566 IFPS=9120THENGOTO2020
570 RETURN
600 PB=PS+22 P1=PC+22
610 PB=PB+22 P1=P1+22
620 POKEPB-22,32 POKEPS,59
630 POKEPB,62 POKEP1,7
640 IFPB=8142THENPOKEPB,32 POKEPB,63 POKEP1,3
  GOTO280
650 IFPEEK(PB+22)=61THENLI=L1-1 QUSUB2000 GOTO200
660 GOTO610
900 R=INT(RND(1)*3)+1 PS=PS+R PC=PC+R SC=SC+1
901 POKEPS,59 POKEPS+1,60 POKEPC,2 POKEPC+1,2
  POKEMB,32 POKEPS-R,32 POKEPS+R+1,32
902 POKE36879,15 POKE36877,250 FORI=1T0250
  NEXT POKE36877,0
910 POKE36879,0 GOTO235
1000 POKE52,20 POKE56,20 CLR
1010 FORI=168T07679 POKEI,PEEK(I+25600):NEXT
1020 POKE36869,255
1025 A=7640
1030 FORI=ATOR+39 READU POKEI,U NEXT
1040 DATA7,29,15,7,3,3,7,5
1050 DATA156,184,240,224,192,192,224,168
1060 DATA0,36,36,60,24,24,126,102
1070 DATA0,24,80,110,60,24,8,0
1080 DATA253,255,255,255,255,255,255,255
1090 GOTO150
2000 FORI=255T0200STEP-1 POKE36878,15 POKE36877,1
  NEXT POKE36878,0 POKE36877,0
2005 POKEPB,32
2006 IFLI=0THEN2020
2010 RETURN
2020 PRINT "SORRY THE SEAHAWKS HAVE DONE AND
  GOT YOU"
2030 PRINT "YOU MANAGED TO KILL".SC
2040 PRINT "SEAHAWKS."
2045 IFSC=HIGOTO2085
2050 IFSC=HITHENPRINT "YOU'RE THE NEW SEA-
  HAWK CHAMPION KILLER" H1=SC GOTO2090
2060 IFSC=0THENPRINT "YOU'RE PATHETIC!" GOTO2100
2070 IFSC=H1/2THENPRINT "NOT VERY GOOD" GOTO2100
2080 IFSC=H1/2THENPRINT "NOT BAD" GOTO2100
2085 IFSC=HITHENPRINT "JOINT CHAMP!" SC=H1 N8=J8
2090 INPUT "YOUR NAME CHAMP:"N8
2100 PRINT "PRESENT CHAMP IS "N8
2105 PRINT "CHAMP'S SCORE IS "H1
2110 PRINT "DO YOU WISH TO PLAY AGAIN (Y/N)?"
2120 GETA IFA="Y"THENGOTO170
2130 IFA="N"THENPRINT "J":END
2140 IFA="N"THENPRINT "J":END
2150 GOTO2120

```

Invaders
by Paul Hampson


```

420CLS
430PROC BIGPRINT(10,4,CHR$(14)+CHR$(13),"SQUARE ROOTS")
440PRINT TAB(2,1);CHR$(13);:INPUT "Enter your number : "
450PRINT TAB(3,14)"The square root is : ";:SQR
460PRINT TAB(4,19);CHR$(129);"Another square root
(Y/N)?";:A$=GET$
470IF A$="Y" THEN 440
480ENDPROC
490DEFPROC SQUARE
500CLS
510PROC BIGPRINT(12,4,CHR$(14)+CHR$(13),"SQUARES")
520PRINT TAB(2,1);CHR$(13);:INPUT "Enter your number : "
530PRINT TAB(3,14)"The square is : ";:Y^2
540PRINT TAB(4,19);CHR$(129);"Another Square (Y/N)?";:
A$=GET$
550IF A$="Y" THEN 520
560ENDPROC
570DEFPROC SINE
580CLS
590PROC BIGPRINT(13,4,CHR$(14)+CHR$(13),"SINES")
600PRINT TAB(2,1);CHR$(13);:INPUT "Enter your angle
(degrees) : "
610X=RADY
620IF SINX<5E-5 THEN SINX=0
630PRINT TAB(3,14)"The sine is : ";:SINX
640PRINT TAB(4,19);CHR$(129);"Another Sine (Y/N)?";:
A$=GET$
650IF A$="Y" THEN 600
660ENDPROC
670DEFPROC COSINE
680CLS
690PROC BIGPRINT(13,4,CHR$(14)+CHR$(13),"COSINES")
700PRINT TAB(2,1);CHR$(13);:INPUT "Enter your angle
(degrees) : "
710X=RADY
720IF COSX<5E-5 THEN COSX=0
730PRINT TAB(3,14)"The Cosine is : ";:COSX
740PRINT TAB(4,19);CHR$(129);"Another Cosine (Y/N)?";:
A$=GET$
750IF A$="Y" THEN 700
760ENDPROC
770DEFPROC TANGENT
780CLS
790PROC BIGPRINT(13,4,CHR$(14)+CHR$(13),"TANGENTS")
800PRINT TAB(2,1);CHR$(13);:INPUT "Enter the angle
(degrees) : "
810X=RADY
820IF TANX<5E-5 THEN TANX=0
830PRINT TAB(3,14)"The Tangent is : ";:TANX
840IF Y<5E-5 THEN Y=0
850PRINT TAB(4,19);CHR$(129);"Another Tangent (Y/N)? "
A$=GET$
860IF A$="Y" THEN 800
870ENDPROC
880DEFPROC INSTRUCTIONS
890CLS
900PROC BIGPRINT(10,2,CHR$(14)+CHR$(13),"INSTRUCTIONS")
910PRINT TAB(1,7)"This Program allows the user to
calculate logarithms, lines, square roots and
other mathematical functions."
920PRINT TAB(1,12)"The escape key will return you to
the main menu at any time"
930PROC BIGPRINT(10,21,CHR$(14)+CHR$(13),"PRESS ANY KEY")
930ENDPROC
940DEFPROC TITLES
950CLS
960PROC BIGPRINT(12,3,CHR$(14)+CHR$(13),"MATHEMATICAL")
970PROC BIGPRINT(14,2,CHR$(14)+CHR$(13),"TABLES")
980PROC BIGPRINT(16,11,CHR$(14)+CHR$(13),"BY")
990PROC BIGPRINT(19,15,CHR$(14)+CHR$(13),"STEPHEN
LAVERTON")
000PROC BIGPRINT(10,21,CHR$(14)+CHR$(13),"PRESS ANY
KEY")
010A$=GET$
020ENDPROC

```

Mathematics
by Stephen Laverton

Curve

on Oric

This program written for the Oric is very simple but quite useful for the mathematician. It is designed to draw a curve, either the sine or cosine curve depending on

which one you input.

The program is very straight forward, the only confusing lines are lines 80 and 110. These contain the values of X and Y which incidentally are the variables for the cursor position.

When you have finished typing in the listing and have typed Run you are told to

enter your required curve. 'S' stands for sine and 'C' stands for cosine. When the plotting has finished it returns to the beginning of the program and so you can try plotting a different curve.

The axis range from 0 degrees to 360 degrees on the X axis and from -90 degrees to +90 degrees on the Y axis.

```

10 PRINT CHR$(17) CHR$(6): PAPER0: INK2: HIRES
20 PRINT "Enter the required wave (S/C)"
30 GETW$
40 CLS
50 IF W$= "S" THEN PLAY1,0,1,500: GOTO 80
60 IF W$= "C" THEN PLAY1,0,1,500: GOTO 110
70 GOTO 20
80 HIRES: GOSUB 140: FOR X=0 TO 239: Y=99*SIN(*PI/120)
+99: CURSET X,Y,1: NEXT X
90 PRINT: PRINT CHR$(140) CHR$(129)"THE SINE WAVE"
100 PLAY1,1,3,800: GOTO 20
110 HIRES: GOSUB 140: FOR X=0 TO 239: Y=99*COS(*PI/120)
+99: CURSET X,Y,1: NEXT X
120 PRINT: PRINT CHR$(140) CHR$(129)"THE COSINE WAVE"
130 PLAY1,1,3,800: GOTO 20
140 CURSET 0,0,3: DRAW 0,199,1: CURSET 0,99,3: DRAW
237,0,1: RETURN

```

Curve
by Stephen Chalmers

Stock Market on Spectrum

This program tests your skill in making

money on the Stock Market. You have three months to make your £800 into £100,000. Easy? It is until you start paying tax on your stocks which can be as much as 50 percent of your shares. To save the

program type GOTO 9800.

If you need to know how much memory you have left type Print in a\$(). If, however, you have a 48K model then change the 9216 in line 9999 to 41984.

```

10 REM *****
20 REM ***** STOCK MARKET *****
30 REM ***** SDA - WALL STREET *****
40 REM *****
50 LET G=0 LET S=0 LET NI=0
60 POKE 23656,B: GO SUB 8000:
GO SUB 5000
70 LET MONEY=800: CLS
80 REM *****
90 REM ***** MAIN PROGRAM *****
100 REM *****
110 FOR A=1 TO 12
120 FOR M=1 TO 5: IF MONEY>=1E5
THEN GO TO 6000
130 LET B$="Monday" AND M=1)+("
Tuesday" AND M=2)+("Wednesday"
AND M=3)+("Thursday" AND M=4)+("
Friday" AND M=5)
140 POKE 23692,255: IF AND=5:
THEN GO SUB 8500
150 GO SUB 1000
160 PRINT "TAB 10;D$;" W$;" "
A
170 PRINT "TAB 12;"Prices;"TA
B 11;"Gold..."P(1);TAB 11;"S
ilver..."P(2);TAB 11;"Ni
ckel..."P(3);TAB 11;"Lead..."P(4)
180 PRINT "TAB 10;"You have £"
MONEY
190 PRINT #0;"Option ?(A/E/C/D/
E/F) "
200 LET A$=INKEY$: IF A$<"A" OR
A$>"F" THEN GO TO 200
210 INPUT " "
220 IF A$="A" THEN GO SUB 1500
230 IF A$="B" THEN GO TO 170
240 IF A$="C" THEN GO SUB 5000
250 IF A$="D" THEN GO SUB 3000
260 IF A$="E" THEN GO SUB 4000
270 IF A$="F" THEN NEXT M: NEXT
A: GO TO 9500
280 IF MONEY>=1E5 THEN GO TO 6E
3
280 GO TO 190
1000 REM *****
1010 REM ***** PRICES *****
1020 REM *****
1030 DIM P(4)
1040 LET P(1)=(INT (RND*501))+20
1050 LET P(2)=(INT (RND*501))+15
1060 LET P(3)=(INT (RND*401))+10
1070 LET P(4)=(INT (RND*251))+50
1080 RETURN
1090 REM *****
1100 REM ***** POSSESSIONS *****
1110 REM *****
1120 REM *****
1130 POKE 23692,255: PRINT "TAB
10;"Possessions;"TAB 11;"Gold..."
P(1);TAB 11;"Silver..."P(2);TAB 11
;"Nickel..."P(3);TAB 11;"Lead..."
P(4);TAB 10;"Money..."MONEY
1140 RETURN
1150 REM *****
1160 REM ***** BUY *****
1170 REM *****
1180 PRINT "PRINT #0;AT 0.4;"WA
it do you wish to buy ?"AT 1,13
" (G/S/N/L) "
1190 LET B$=INKEY$
1200 IF B$="G" OR B$="S" OR B$="
N" OR B$="L" THEN GO TO 3050
1210 GO TO 3040
1220 IF B$="G" THEN LET AM=INT (
MONEY/P(1))
1230 IF B$="S" THEN LET AM=INT (
MONEY/P(2))
1240 IF B$="N" THEN LET AM=INT (
MONEY/P(3))
1250 IF B$="L" THEN LET AM=INT (
MONEY/P(4))
1260 POKE 23692,255
1270 INPUT "You can afford "AM
" How many do you want ?" LINE
Z$
1280 IF Z$="" THEN GO TO 3100
1290 IF Z$(1)<"0" OR Z$(1)>"9" T
HEN GO TO 3100
1300 IF VAL Z$>AM THEN GO TO 310
0
1310 IF B$="G" THEN LET MONEY=M
ONEY-(P(1)*VAL Z$): LET G=G+VAL Z
$

```

```

3140 IF B$="S" THEN LET MONEY=M
ONEY-(P(2)*VAL Z$): LET S=S+VAL Z
$
3150 IF B$="N" THEN LET MONEY=M
ONEY-(P(3)*VAL Z$): LET NI=NI+VAL
Z$
3160 IF B$="L" THEN LET MONEY=M
ONEY-(P(4)*VAL Z$): LET L=L+VAL Z
$
3170 INPUT " " RETURN
4000 REM *****
4010 REM ***** SELL *****
4020 REM *****
4030 PRINT "PRINT #0;AT 0.3;"WA
it do you want to sell ?"AT 1,10
" (G/S/N/L) "
4040 LET B$=INKEY$
4050 IF B$="G" OR B$="S" OR B$="
N" OR B$="L" THEN INPUT " " GO T
O 4070
4060 GO TO 4050
4070 PRINT "PRINT AT 21.0;"You
have "
4080 PRINT (G AND B$="G")+("S AND
B$="S")+("NI AND B$="N")+("L AND
B$="L")
4090 INPUT "How many do you wish
to sell ?" LINE Z$
4095 IF Z$="" THEN GO TO 4090
4100 IF Z$(1)<"0" OR Z$(1)>"9" T
HEN GO TO 4090
4110 IF B$="G" AND VAL Z$>G THEN
GO TO 4090
4120 IF B$="S" AND VAL Z$>S THEN
GO TO 4090
4130 IF B$="N" AND VAL Z$>NI THEN
GO TO 4090
4140 IF B$="L" AND VAL Z$>L THEN
GO TO 4090
4150 IF B$="G" THEN LET MONEY=M
ONEY+(P(1)*VAL Z$): LET G=G+VAL Z
$
4160 IF B$="S" THEN LET MONEY=M
ONEY+(P(2)*VAL Z$): LET S=S+VAL Z
$
4170 IF B$="N" THEN LET MONEY=M
ONEY+(P(3)*VAL Z$): LET NI=NI+VAL
Z$
4180 IF B$="L" THEN LET MONEY=M
ONEY+(P(4)*VAL Z$): LET L=L+VAL Z
$
4190 PRINT AT 20.0;" "

```

```

4200 RETURN
5000 REM *****
5010 REM ***** INSTRUCTIONS *****
5020 REM *****
5030 CLS: LET H$="INSTRUCTIONS"
*****
5040 FOR M=1 TO 11
5050 PRINT AT 0.0,M$
5060 LET H$=H$(32)+M$
5070 LET H$=H$( TO 32)
5080 PAUSE 5
5090 NEXT M
5100 PRINT AT 3.1;"The idea of t
his program is to accumulate £10
0,000 during three months on the
Stock Exchange."
5110 PRINT AT 7.1;"You achieve t
his by dealing in Gold,Silver,Ni
ckel and Lead. The price of these
commodities varies as shown below
"
5120 PRINT AT 12.3;"Commodity
"
5130 PRINT AT 14.4;"Gold
200 1000"TAB 4;"Silver
150 750"TAB 4;"Nickel
100 500"TAB 4;"Lead
50 300"
5140 GO SUB 9000
5150 PRINT AT 1.1;"At the start
you are given £800 and a display
of the market prices is show
n. Also there are six options wh
ich mean:"
5160 PRINT AT 7.2;"(A) Print you
r possessions"TAB 2;"(B) Pri
nt the market prices"TAB 2;"(
C) Print these instructions"TA
B 2;"(D) Buy commodities"TAB 2;"
(E) Sell commodities"TAB 2;"(F
) Quit"
5170 PRINT AT 19.11;"Good Luck"
5180 GO SUB 9000

```

```

5190 RETURN
5200 REM ***** YOU HAVE SUCCEEDED *****
5210 REM ***** PRINT AT 8,10, "WELL D
5220 CLS
5230 PRINT AT 10,4, "YOU HAVE MAN
5240 AGED TO MAKE"
5250 PRINT AT 12,4, "THE REQUIRED
5260 2100,000"
5270 PRINT AT 14,0, "YOU FINISHED
5280 ON " 08, " WEEK " 08
5290 PRINT AT 16,2, "YOUR AVERAGE
5300 EARNINGS WERE: " AT 17,9, "£", INT
5310 (MONEY/(18*5)+M) " A DAY"
5320 REM *****
5330 REM ***** TA DEMANDS *****
5340 REM *****
5350 REM *****
5360 POKER $2500,000 PRINT "THE
5370 " "You have to pay some tax"
5380 IF AND $5 THEN GO TO 5700
5390 PRINT "The rate is 1/4 of
5400 your shares"
5410 LET G=G-(INT (G/4)): LET S=
5420 S-(INT (S/4)): LET NI=NI-(INT (N
5430 I/4)): LET L=L-(INT (L/4))
5440 RETURN
5450 PRINT "The rate is 1/2 of
5460 your shares"
5470 LET G=G-(INT (G/2)): LET S=
5480 S-(INT (S/2)): LET NI=NI-(INT (N
5490 I/2)): LET L=L-(INT (L/2))
5500 RETURN
5510 REM ***** FRONT PAGE *****
5520 REM *****
5530 BORDER 1, INK 7, PAPER 1, C
5540 CLS
5550 DIM N$(2,32)
5560 LET N$(1,0) = "SPEC *****"
5570 LET N$(2,0) = "DOFT *****"
5580 FOR N=0 TO 4 STEP 2
5590 PRINT AT N,0, "*****"
5600 NEXT N
5610 FOR N=1 TO 14
5620 PRINT AT 1,0, N$(1), AT 3,0, N
5630 $(2)
5640 LET N$(1) = N$(1,32) + N$(1)
5650 LET N$(2) = N$(2,32) + N$(2)
5660 LET N$(1) = N$(1, TO 32)
5670 LET N$(2) = N$(2, TO 32)
5680 NEXT N
5690 PRINT AT 5,12, "PRESENTS
5700 *****"

```

```

5180 PRINT AT 10,8, "X STOCK MARK
5190 ET "
5200 PRINT AT 15,6, "O GUY FULLAL
5210 DUE 1983"
5220 PLOT 0,0: FOR N=1 TO 3
5230 DRAW 32,32: DRAW 32,-32
5240 NEXT N: DRAW 32,32: DRAW 30
5250 -32
5260 PLOT 0,32: FOR N=1 TO 3
5270 DRAW 32,-32: DRAW 32,32
5280 NEXT N: DRAW 32,-32: DRAW 3
5290 0,32
5300 REM *****
5310 REM ***** PRESS ANY KE
5320 REM *****
5330 PRINT AT 4,4, FLASH 1: "P
5340 ess any key to continue"
5350 PAUSE 0
5360 INPUT "
5370 CLS
5380 RETURN
5390 REM *****
5400 REM ***** YOU LOSE *****
5410 REM *****
5420 REM *****
5430 CLS
5440 PRINT AT 5,7, "YOU HAV
5450 E FAILED TO "
5460 PRINT AT 9,8, "REACH YOUR TA
5470 RGET"
5480 PRINT AT 12,0, "KEEP AWAY FF
5490 OM THE STOCK MARKET", AT 14,9, "IN
5500 THE FUTURE"
5510 PRINT AT 19,7, "ANOTHER GO
5520 (Y/N)"
5530 FOR N=-10 TO 20
5540 LET S=INKEY$
5550 IF S="Y" THEN RUN
5560 IF S="N" THEN STOP
5570 BECP .01,N
5580 NEXT N
5590 GO TO 5570
5600 REM *****
5610 REM ***** AUTO RUN SAVE *****
5620 REM *****
5630 SAVE "STOCK MAR" LINE 20
5640 VERIFY "Stock Mar"
5650 STOP
5660 REM *****
5670 REM ***** HOW MUCH MEMORY LEFT *****
5680 REM ***** PRINT ON OFF *****
5690 REM *****
5700 DEF FN A$(STR$(19218-112
5710 EK 23641+256*PEEK 23642)-(PEEK 2
5720 3635+256*PEEK 23636))) " Bytes"

```

Stockmarket
by Guy Fullalove

Weird Waves

on BBC

This program is designed to demonstrate the colour capabilities of the BBC Model B computer. The program operates in mode

1 and produces four waves in a random colour using the first digit of the GCOL command.

The waves are produced using two sine waves, to which the computer moves to the relative point and then draws to the point on the second sine wave producing a solid wave of colour.

Because the colours are random it will use different colours each time it is run, but the waves remain the same because they are stored in a Data statement.

The program will run on a Model A in mode 5 by changing the mode statement in line 50. 1 and 21 are the numbers which the waves are based on.

```

10 REM WEIRD WAVES
20 REM By C.Ross 26.4.83
30 REM (C) copyright
40 REM This program is designed to de
monstrate the GCOL command in an interest
ing way.
50 MODE 1: REM MODE 5 if using Model
A
60 FOR N=1 TO 4
70 CLS
80 READ Z,Z1
90 C=RND(1000)
100 GCOL C,4:PRINT "GCOL (",C),",1",,PRI
NT "Z=",Z," Z1=",Z1
110 FOR XX=1 TO 1280 STEP 5
120 YX=500-Z+500-Z*SIN((XX/Z*2)*PI)
130 MOVE XX,YX
140 YX=500-Z1+500-Z1*SIN((XX/Z1*2)*PI)
150 DRAW XX,YX
160 NEXT XX
170 NEXT N
180 END
190 DATA 200,300,100,300,150,270,
300,475

```

Weird Waves
by Christopher Ross

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OPEN FORUM

Solids

on ZX81

This program is for any ZX81 either expanded or unexpanded. It will find the volumes of the five main objects one considers for O-level maths: ie, the cube, the cylinder, the cone, the sphere and the square-based pyramid. The program is an example of memory economy using codes of characters and the calling of the same routines by different parts of the program.

The line numbers of these routines are stored as variables at the beginning of the program thus one can save memory by calling the variable: instead of, for example, 26 Goto Code "8" we get the line 26 Goto E thus saving three bytes.

The graphics characters used in the program are as follows: character 7, Lines 8 and 10; character 1 and character 5, Line 12; character 3, Lines 25 and 35; character 4 and character 3, Line 29.

I hope other users, especially maths candidates, find this program useful.

Program notes

- 1-4 Line numbers of important routines
- 5-12 Choose which volume you require
- 13-15 Volume of cube
- 16-21 Volume of cylinder
- 22-26 Volume of cone
- 28-30 Volume of sphere
- 33-35 Volume of pyramid
- 36-38 Print volume of object and stop
- 39-47 Main routines to input certain measurements.

The user should be careful to input all measurements in the same scale; eg, mm, cm, etc, or he/she will get some very funny results.

```

1 LET E=CODE "8"
2 LET S=CODE "8"
3 LET D=CODE "E"
4 LET I=CODE "H"
5 PRINT "1..CUBE" "2..CYLINDER"
6 PRINT "3..CONE" "4..SPHERE" "5..PYR"
7 PRINT "6..SQUARE BASED"
8 PRINT "PRESS NO."
9 LET A$=INKEY$
10 IF A$=" " THEN GOTO CODE "F"
11 IF CODE A$ > CODE "0" AND CODE A$ < CODE "5" THEN GOTO VAL "11"
12 GOTO CODE "F"
13 CLS
14 GOTO CODE "8" + (VAL A$ - CODE "0")
15 GOTO E
16 LET U=B*2+D
17 GOTO E
18 GOTO S
19 GOTO I
20 LET V=R*R*PI*H
21 GOTO E
22 GOTO D
23 GOTO D
24 GOTO I

```

```

25 LET V=PI*R*R*H/3/4/5/6/7/8/9/10/11/12/13/14/15/16/17/18/19/20/21/22/23/24/25/26/27/28/29/30/31/32/33/34/35/36/37/38/39/40/41/42/43/44/45/46/47
26 GOTO E
27 GOTO S
28 GOTO D
29 LET V=CODE " " + (R*R*R*PI/3/4/5/6/7/8/9/10/11/12/13/14/15/16/17/18/19/20/21/22/23/24/25/26/27/28/29/30/31/32/33/34/35/36/37/38/39/40/41/42/43/44/45/46/47)
30 GOTO E
31 GOTO S
32 GOTO D
33 LET V=B*B*B/6/7/8/9/10/11/12/13/14/15/16/17/18/19/20/21/22/23/24/25/26/27/28/29/30/31/32/33/34/35/36/37/38/39/40/41/42/43/44/45/46/47
34 CLS
35 PRINT "VOL OF OBJECT="; V
36 STOP
37 PRINT "BASE SIDE?"
38 INPUT B
39 RETURN
40 PRINT "RADIUS?"
41 INPUT R
42 RETURN
43 PRINT "VERTICAL HEIGHT?"
44 INPUT H
45 RETURN

```

Solids
by Mike Davies

XXX

on Vic20

This program will run on a basic Vic20 micro computer. The machine code routine locates itself at HEX:1D72 that is 7538:DEC. The program is started by typing SYS(7538). And to break from it press Run Stop and Restore.

```

1 REM PROGRAM XXXX
5 REM BY STEVEN JONAS
10 DATA 120,169,127,141,20,3,169,
29,141,21,3,88,96,169,25,141,
15,144,165,197,201,15
20 DATA 208,42,238,1,144,238,1,144,
238,1,144,169,0,141,15,144,168,
0,208,192,235
30 DATA 208,251,168,0,208,192,235,
208,251,206,1,144,206,1,144,
206,1,144,169,25,14,1,13
40 DATA 144,75,191,234,234
50 FOR I=7538 TO 7607:READ A:POKE I,A
NEXT
60 SYS(7538)

```

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Each month we will publish the name of the winner and the new Cruising high score. Are you good enough to accept the Cruising challenge?

The winner of last month's competition with a score of 22664 was I. C. Willis of Shore Lane, Sheffield, who receives £10. Entries for this month's competition close on June 30.

Notes

- 1) Each entry must consist of a ZX printout and your name and address.

2) Closing date for this month's Cruising challenge entries is June 30.

3) The highest score each month will receive £10.

4) High scores cannot be transferred from one month to another.

5) The judges' decision is final.

6) No employees of Sunshine Publications Ltd, or their families, will be eligible to enter.

Blind Alley

Blind Alley is a game of strategy. In order to win you must outwit the computer, using your craft to fence in and finally destroy the enemy pursuit vehicles. But, watch out for the solid trail left by your opponents - one touch is fatal!

Each month Popular Computing Weekly is giving away £10 to the player with the highest score on Blind Alley. To enter this month's competition simply send in a copy of your score and the code at the bottom of the score table, together with your name and address to:

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The highest score sent in so far is 70625 from Stuart Williamson of Bradford, West Yorks. Entries for this month's competition close on June 30.

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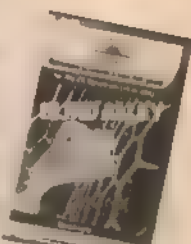


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Volcanic catacombs

Camel Software of Slough has had considerable and well-earned success with its *Volcanic Dungeon* program for the ZX81. The company has recently released versions for the 48K Spectrum and the Dragon.

For those of you who have not seen *Volcanic Dungeon*, it follows the same company's *Black Crystal* in being very well-packaged in a large box, complete with booklet. The first two pages contain the now obligatory bit of fantastic scene-setting which everyone must now include with their cassettes — a story about Methzar, goddess of evil, who captures the elfin princess Edora, and, with the help of the witch Magra, imprisons her in a crystal coffin somewhere within the catacombs of the *Volcanic Dungeon*.

The Princess knows the secret of the whereabouts of the seeds of life. You are charged by her father, now near to death, with rescuing the princess and thus lifting the blight that has settled on the land.

At the start of the game, you are at the entrance to the *Volcanic Dungeon*, excavated by dwarfs — you have with you a sword, and a magic ring which will change shape according to the current strength of the witch Magra. She is loose somewhere within the cave complex, and you will have to do battle with her eventually. As you move through the caves, you have the aid of a map given to you by the dwarfish builders of the dungeon.

This is a text adventure, although unusually, the text is white on black. The display includes the magic ring, at the top of the screen, with its changing shades, and a graphic representation of your current weapons and armour.

You are allowed to carry 10 weapons, including the original sword. These weapons are scattered at random throughout the complex and, assuming that no monster is guarding them, may be picked up or discarded at will.

The game is beautifully balanced. Each weapon has its own attack and defence capabilities — your knowledge of mythology will be put to the test when selecting a weapon for battle with particular monsters. Thus, the stake is obviously a good

weapon when fighting the vampire, and the dragon's tear is the defence against a cyclops. How, though, do you kill the dragon to get its tear, and what weapon will you use to fight the witch?

Not only has the weapons system been well thought out, so has the movement system. Each of your moves, or attack/defend commands, uses up one of your strength units and one of your water units, both originally set at 100. Each monster you kill will bump up your strength rating (so you can't keep avoiding battle), but your water can only be replenished by finding one of the four wells.

On rescuing the princess (he says it so glibly!), your strength rating falls dramatically, and you will use up your water twice the initial rate in getting the princess out — and the monsters are still about!

The whole game mechanism makes for a very addictive program, and one that remains a firm favourite with many adventurers. Apparently there is some competition among many of the fans of *Volcanic Dungeon*, to see who can complete the adventure in the quickest time. Well, now there is an official competition run by Camel, details of which are printed in the booklet. Two weeks in Florida, including visits to the Epcot Center — how about that for first prize? The final will be held at the Earl's Court Computer Fair in June.

Now, a plea for help! Since I first asked you to send in your requests for tips to get you through sticky situations, I've been inundated with letters. What I need now are more tips and hints from you, the readers. I have a number of questions about *Vic20* adventures, as well as *Dragons* and *Alaris*. If you have a few spare minutes between adventures, just jot down a few thoughts you've had whilst playing particular adventures, and the strategy you've used to complete them. I hope then to match these up with the *Help* letters. With advice from the manufacturers, we should be able to build up a good library of tips.

One or two of you have taken me to task for not replying personally to your letters. I apologise, but there are so many letters that I can only reply to them through this column.

Talking of readers' letters, and manufacturers, I'm reminded of a point raised by John Shiali, whose letter I mentioned a couple of weeks ago. He wonders if, with the advent (no pun intended!) of the *Timex 2000* (Spectrum to us), we might eventually see some Scott Adams adventures, currently enjoyed by those lucky Vicers. By all accounts they are archetypal difficult games — maybe we should get up a petition to get these adventures converted to other micros.

J Eldridge is stuck at the forcefield on Artic's *Planet of Death*. Run our decoding program, and then type in:

```

"feath" + "ru" + "s" + "edcrlrtuae"
and
"cpelaethrgoyours" + "del" + "rrml" + "r" + "msr"

```

Mr Eldridge has a tip for anyone just beginning *Planet of Death*, and who might



be having trouble in the laser shed. Make sure you have the board, and then:

```
"u" + "s" + "s" + "s" + "wdrshbtsadnoeodork" + "o"
```

John, from Crescent Road in Dagenham is trying to get at the *Inca Treasure* (oh right, Artic's *Adventure 5*) with his Spectrum. You're nearly there, John, but try typing this:

```
"vestishees" + "com" + "vgskvolset1"
```

then

```
"b" + "s" + "kmeac" + "uorl/bpeklogesult" + "s"
+ "hvalsls/rgr" + "koedluood"
```

That'll get you into the temple, there's still a lot to do — good luck!

Incidentally, some of you have followed my advice and sent Artic your SAE's requesting *Help* sheets. After several weeks — no reply. I agree that this is not good public relations, but let's give them the benefit of the doubt and assume that they're working on *Adventure E* for us even now.

In the meantime: keep your eye on the *Cyclops*!

● *Inventory*: this is another of those words which are often left undocumented in an adventure program. It's a way to look at what you're carrying — you wouldn't want to attack an Orc when you're carrying in an empty bottle, would you? (Oh, I don't know, though, it might be made of glass, and that might have some effect, but then bottles in most adventures are, perversely, mostly of leather!). Often abbreviated *Invnt*, though not *In*, you might end up somewhere you don't want to explore just yet! You might also want to try *List*.

This series of articles is designed for novice and experienced Adventurers alike. Each week Tony Bridge will be looking at different Adventures and advising you on some of the problems and pitfalls you can expect to encounter. So, if you have an Adventure you want reviewed, or if you are stuck in an Adventure and cannot progress any further, write to Tony Bridge, Adventure Corner, Popular Computing Weekly, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.

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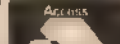
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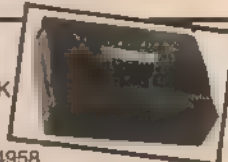
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A CERTAIN TOUCH

F Hill of Horridge Farm, Ashford, near Banstable, Devon, writes:

Q How do you incorporate data statements in a Spectrum? Also, could you please stop putting Spectrum programs under ZX81 programs.

PS. The magazine lost a certain touch when it lost Citizen Pain.

A Data statements must be used along with Read commands — one without the other will produce an error code. The other associated command is Restore, though this is not always necessary.

Individual pieces of data must be separated by a comma, and Data statements used to assign values to a string must always be in inverted commas.

The Read statement must be used to read each item of Data from the Data statement. That is why the Data statement must always be arranged after the Read command in the program. Until you get used to using them you might find it best to follow the Read statement with its Data statement immediately, it certainly makes for easier editing. However, it is generally considered better to keep all the Data statements together at the end of a program. Read/ Data lines can be very fickle. A Read statement is always followed by a variable, to which the value of the data will be assigned. If you put the wrong type of variable into the Data statement, the computer will not ignore it and carry on until it finds the first appropriate Data statement — it will give an error message. Try running this:

10 READ A

20 DATA Jan, Is, 300
30 PRINT A

Now try changing Line 20 to:

20 DATA 100, 200, 300,

and add:

40 GOTO 10

To see how a string works Enter the following:

20 READ A\$

30 DATA "Jan", "Is", "100".

40 PRINT A\$

50 GOTO 20

You refrain from telling us what sort of 'touch' we lost with the demise of 'Citizen Pain'. Could you mean the touch of gold, the touch of death or what...?

HOW MANY BYTES...

John Baseford of Compass Crescent, Old Whittington, Chesterfield, writes:

Q If the Vic20 in its unexpanded form has 5K of memory, how come that when I switch it on it says 3583 bytes free? This to my reckoning is one byte less than 3½K. Is this one byte taken up with the flashing cursor?

A The reason that the Vic only has 3.5K of user available RAM on the unexpanded machine, is because 1K is taken up by the systems variables at the bottom of the memory, and 0.5K is used for the screen. All computers need to have some space in the RAM reserved for use by the ROM.

As for the odd 1 byte missing; in fact this is the same situation that I have explained before, namely the first address used by a computer is 0 which makes the second address 1, and so on.

ATARI MAGAZINES

Julian Bentley of The Lea, Trentham, Stoke-on-Trent, writes:

Q I am 12 years old, and am thinking of buying an Atari 400. I would like to know if an Atari 400 (16K) is expandable to 32K. If there is an expansion available I would like to know how much it costs, and who I can get it from. I would also like to know if there is a magazine for the Atari, and if a cassette is necessary for most programs on the Atari.

A A 32K RAM board for the Atari 400/800 is avail-

able from the Spectrum group of shops for £75. Your nearest Spectrum shop is probably Computarama, 11 Market Square, Stoke-on-Trent.

At least two shops run clubs for Atari owners; one is run from the Silica shop at 1-4 The Mews, Hatherley Road, Sidcup, Kent. Another can be contacted through Maplin at PO Box 3, Rayleigh, Essex.

The cassette player is not absolutely necessary for the Atari, because of the number of modules that are available. However, if you have no way of storing your own programs, you are likely to find it difficult to develop your own programming skills. You will also find that you will be cut off from a great many other programs that are available on cassette.

DELAYED COUPLER

N G Macmillan of Lochgreen Avenue, Brassie, Troon, Ayrshire, writes:

Q Could you please tell me which of the two micros, the BBC B and the Spectrum, would download programs from the Micronet database (via a telephone) faster? Would the data or programs be fed into the RS432 socket, or the tape socket on the BBC machine?

A At the moment the Spectrum is still not on line with the Micronet 800 network, though this should change quite soon. The transmission rate from the database to you is governed by British Telecom and is at a standard 1200 Baud. The transmission from you to the database is at 75 Baud. I presume that the delay with the Spectrum coupler is because of the necessary software that will enable the Spectrum to interpret 1200 Baud, instead of its normal 1500 Baud.

The Acoustic coupler is a separate unit, that uses an RS232 interface, so at the moment it is only available on the BBC B.

Is there anything about your computer you don't understand, and which everyone else seems to take for granted? Whatever your problem Peek it to Ian Beardsmore and every week he will Poke back as many answers as he can. The address is Peek & Poke, PCW, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.

AT THE RACES!

Mr P B Pardon of Bristol Road, Birmingham, writes:

Q I wish to place details from various race meetings into a computer in such a way that I can juggle any part that is necessary. I also want to be able to extract performance details for types of race, distance, and numbers of runners. Would this be possible on a ZX81 with the proposed new microdrive? If not, have you any ideas which home micro would be useful for handling this type of material. As I do not know anything about computers I would be grateful if you could give me some advice.

A What you are after is a 'calc' program, some were reviewed by Tony Bridge in *Popular Computing Weekly*, Issue 15, including Vucalc, Matacalc, Omnicalc, and Flexicalc. All these are aimed at the Spectrum, but there are several 'calc' type programs available for the ZX81 as well.

A lot will depend on what else you want to do with your computer. If you don't want to spend a lot of money, and want to use it for games as well, then a 48K Spectrum would be as good a buy as any, and probably better if you are already used to Sinclair BASIC.

As for the Microdrives, I do not expect them to be available for some months yet, though they should be useable on a ZX81 soon after being released. The problem with a ZX81, and the amount of information that you want to use, is the Loading time of any program or data stored on cassette tape.

I do not usually recommend a specific machine, because it depends on how much money you want to spend. However, I would suggest that you look at issue 15 and if this is the sort of program you are after, then a Spectrum would probably be your best choice.

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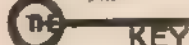
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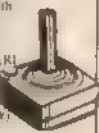
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Supplier MKI Software
30 Painswick Road
Birmingham B28 0HF

LIMITED INFO



Wintersoft has issued an adventure game for the Dragon 32.

Called *The Ring of Darkness*, the game consists of several parts which are loaded separately. At the opening of the game you set up your character whose attributes in terms of strength, magical ability, etc. you choose according to what you value most.

The arrow keys are used for movement and other commands are given as two or more letters.

The information given on the cassette inlay is deliberately limited, so that you can experience the pleasure — or irritation — of having to discover everything for yourself.

Program *The Ring of Darkness*
Price £10.00

Micro Dragon 32
Supplier Wintersoft
30 Uplands Park Road
Enfield
Middle EN2 7PT

2 ÷ 4

Numerons is the first release I've seen for the Lynx — for some reason this machine has been largely ignored by the software houses so far.

Numerons is published by Camsoft, which is part of Computers, the company behind the hardware.

The game uses a vaguely *Invaders* like scenario to teach multiplication and division. Each invader is a number at which you must fire a number that divides into it.

The other side of the tape contains *Intronum* which explains the scoring system and introduces the game itself.

Program *Numerons*
Price £9.90
Micro Lynx
Supplier Camsoft
33A Bridge Street
Cambridge CB2 1LW

GUIDERI

Panic is a game for the Spectrum from Mikro-Gen. You must guide a little man, who is trapped underground, making sure he is kept away from the lurking aliens.

Not that this is a totally one-sided affair — you can retaliate, and pretty viciously too, by beating the aliens over the head once they fall into a hole which you have dug.

An added feature is that your air is slowly draining away, so you must defeat the monsters quickly.

Program *Panic*
Price £5.95
Micro Spectrum
Supplier Mikro-Gen
Retail Control
Department
6 Royal Buildings
West Glamorgan
SA13 1DN

DOCTORI

Medidata is a company whose aim is to supply user-friendly software for medical purposes.

Its first package is *Cycle Planner: Growth Tracker*.

This program is designed to enable the female user to predict the various stages of her period cycle.

Program *Cycle Planner*
Price £4.95
Micro Spectrum 48K
Supplier Medidata
PO Box 26
London NW9 9BW

DOUBLE BILL



Jupiter Ace owners must have felt that they have been completely forgotten in the software market — so few programs have been issued.

Perhaps the situation is changing however. Jupiter Cantab has just made nine cassettes available.

Greedy Gobbler is a maze game featuring ghosts and power pills — need I say more. Included on the cassette is another game called *Blow Up the World* in which you must blow up all the land on a map of the world which is spinning past you. It must win the title of "most nihilistic game ever".

Program *Greedy Gobbler/Blow Up the World*
Price £5.95
Micro Jupiter Ace (3K)
Supplier Jupiter Cantab
Chestnut Building
Bateman Street
Cambridge CB2 1LZ

TRAFFIC JAM

The arcade favourite *Frogger* has been adapted for the Vic20 under the title *Froggit*.

This version has 21 levels of

play and uses the hi-res graphics and joystick.

For those few people who have never heard of the game, the object is to guide a frog across a road avoiding the traffic which increases as the game progresses.

Program *Froggit*
Price £5.95
Micro Vic20
Supplier Unit 3
Meadow View
Browston Lane
Browston
Great Yarmouth
Norfolk NR31 9DP

ROUTINE

Compusense is a company which has issued a number of programs for the Dragon 32.

Its latest release is a cartridge — the *DASM Assembler* — which comes in a package including a manual and a quick reference card for the more experienced machine code programmer.

The package is completely compatible with Dragon Basic — enabling you to initialise routines from your own program.

Program *DASM Assembler*
Price £18.95
Micro Dragon 32
Supplier Compusense
PO Box 169
286D Green Lanes
London N13 5TN

MATHS TEST

Geometry is a package designed to test your knowledge of the O-level syllabus.

Six programs take you through Pythagoras, symmetry, properties of circles, etc. The program also gives you the correct answers through a help function, should the answer elude you.

Rose Software, who issues the cassette, also has a number of other educational programs available.

Program *Geometry*
Price £4.95
Micro Spectrum
Supplier Rose Software
148 Widney Lane
Sohull
West Midlands
B91 3LH

NEW RELEASES

BRAIN DRAIN



Brain Drain is a version of the computer game Mastermind for the Commodore 64.

The game involves using your powers of reasoning to discover the correct sequence in a series of colours. At each guess the computer will tell you how many of your colours are correct and how many are in the correct place.

There are three levels which give you four, five or six colours to guess.

Program Brain Drain
Price £9.95
Micro Commodore 64

Supplier ASN Computer Services
17 Adelphi Crescent
Hayes Park
Hayes
Middlesex UB4 8LY

MADE SIMPLE

There are a vast number of books on the Spectrum particularly on simple programming.

Yet another — Exploring Spectrum Basic — uses over 50 programs to illustrate a number of programming techniques. It has some useful tips on places to Poke, how to make the Spectrum run faster, and on using other languages.

Book Exploring Spectrum Basic
Price £4.95
Micro Spectrum 16/48K
Supplier Timedata
16 Hemmells
High Road
Laindon
Basildon
Essex SS15 6ED

ON SAFARI

Spectrum Safari is a game which is claimed to be a mixture of adventure and arcade techniques.

Your aim is to cross an

island and reach a boat to escape. Along the way, you may barter with native traders who will sell you various things including other natives.

The task is complicated by the animals you may meet along the way, all of whom set you some kind of task or puzzle. If you answer wrongly, one of the members of your team gets eaten.

The game features a practise routine and three skill levels.

Program Spectrum Safari
Price £5.95
Micro Spectrum 48K
Supplier A J Rushton
194 Shay Lane
Walton
Wakefield
West Yorkshire
WF2 6NW

MONOPOLYI

Automonopoly is a computer version of the famous board game of property buying and selling.

The producer of the game, Automata, is stressing that, unlike some other versions already available, the computer plays as well and doesn't just display the board and do the banking.

Automata is famous for its Pimania adventure game and infamous for its "best possible taste" offerings. Automonopoly is its first major release in quite a while. I can't help thinking that its timing is somehow connected with the general election — maybe Automata is after the Conservative vote — maybe I'm just suffering from Pimania induced paranoia...

Program Automonopoly
Price £6.00
Micro Spectrum 48K
Supplier Automata
65A Osborne Road
Portsmouth
Hants PO5 3LR

HATCHEDI

Vultures is described as a "Galaxian type game" for the Dragon 32 with one joystick.

The vultures guard their eggs and swoop towards you, while you must try to kill them off. However, ultimate victory is impossible, since the eggs hatch once one wave has been killed off.

Program Vultures
Price £6.95
Micro Dragon 32
Supplier J Morrison (Micros)
2 Glensdale Street
Leeds LS9 9JJ

ARMED COMBAT



A number of companies have been interested in producing a home micro version of the 3D Tank Hunt game found in the arcades.

The first version I've seen has been issued by Artic and is called 3D Combat Zone.

The screen displays the view through your tank windows whilst a radar tells you where the enemy is hidden.

High resolution is used to draw the enemy tank in 3D. The object, obviously, is to shoot the enemy, but your missile, which can be seen disappearing into the distance, will be spotted and the enemy tank will try to avoid it.

The same company has issued two other games at the same time, both based on the arcades, one being Galaxions, the other Panic.

Program 3D Combat Zone
Price £5.95
Micro Spectrum 48K
Supplier Artic Computing
396 James Reckitt
Avenue
Hull
North Humberside

New Releases is designed to let people know what software is coming on to the market. If you have a new game or utility which you are about to release send a copy and accompanying details to: New Releases, Popular Computing Weekly, 19 Whitcomb Street, London WC2 7HF.





For whom the poll tolls

The opinion polls clearly show that the trend of opinion is away from the Conservative Party, towards greater uncertainty in the electorate. With the latest poll I have been able to examine, the Conservative possible vote varies from 39½ percent to 56 percent, the Labour vote varies from 28½ percent to 46 percent, and the Alliance vote varies from 15 percent to 32 percent (*Sunday Mirror*, 22 May, poll on Friday, 20 May, by Marplan).

In another poll, the information for which was collected at about the time of the election declaration, the votes were: Conservative 46 percent to 56 percent, Labour 29 percent to 40 percent, and Alliance 16 percent to 26 percent (*Daily Telegraph*, 12 May, poll previous week by Gallup). It can be seen that the Labour and Alliance votes have stood up during the campaign, whereas the possible minimum vote for the Conservatives has declined.

This change in relative status has not been noticed by most commentators because of an unfortunate habit to concentrate on percentages without considering non-response. In the earlier poll, the degree of ambiguity (ie, non-response, don't know, or vote for "others") was 9 percent, whereas in the later poll the degree of ambiguity was 17 percent.

By various simulations on a computer, I have found that for samples of about 1,000 (most polls claim to have samples of around that size) to claim any greater accuracy than 3 percent either way for a figure is not realistic.

So, to all the lower figures we should therefore mentally subtract 3 percent (less for the Alliance as lower percentages are inherently more stable). The closer a percentage

approaches 50, the greater the inherent variability in estimating that value.

To try to make sense of all these different figures I have developed a method of displaying poll results for three main parties (see *Popular Computing Weekly*, June 2).

The basic shape is an equilateral triangle, with each party being located at an apex of the triangle. The apex represents 100 percent of the vote for that party, and the point in the middle of the side directly opposite represents 0 percent. The dotted lines joining the midpoints are at 50 percent: and, in a perfectly fair distribution of seats, this would represent an overall majority.

If all the percentages (for the three parties) add to 100 percent then the result can be plotted as a point. Otherwise the result is a triangle — the triangle of ambiguity. The larger this triangle the greater the lack of knowledge about voting intentions.

Around the ambiguity triangle is the triangle of confidence. This is a tentative measure of the amount of variability in the estimation of the percentages. Maybe 19 times out of 20 the correct result is within those limits, but we cannot be sure. We can be reasonably sure that the true result is somewhere within the confidence triangle but views change with time.

The clearest trend in the polls so far has been the increasing size of the ambiguity triangle, from a small shape in the first poll to a rather large triangle for the last poll (22 May).

Another trend shows the ambiguity triangle moving towards the centre of the major triangle (the triangle of dominance): support for both Alliance and Labour is keeping up, but the support for the Conservatives is less firm. If these trends continue, the possibility of a hung parliament is greater than it would appear.

The accuracy of polls has always been suspect, and perhaps one reason is the lack of attention paid to those who do not know, or who say they may vote for 'other' parties.

Polls in chronological order of sampling

- 1 *Daily Telegraph*, 12 May (week before), Gallup.
- 2 *Daily Telegraph*, 19 May (week before), Gallup.
- 3 *Sunday Times*, 22 May (Tues/Wed), MORI.
- 4 *Daily Express*, 20 May (Thurs), MORI.
- 5 *Observer*, 22 May (Thurs/Fri), Harris.
- 6 *Sunday Mirror*, 22 May (Fri), Marplan.

Boris Allan

Puzzle

Standard or de-luxe?

Puzzle No 59

The Downshire Wolzitz Marketing Company is a world leader in its field — Wolzits.

As you will be aware, amongst the many mechanical parts which are to be found in a Wolzitz, the humble grommet screws are most vital if the efficient geometry of the design is not to be endangered.

In fact, in each standard model Wolzitz is found a total of one hundred and fifty-seven screws. The de-luxe version, contains no fewer than one hundred and eighty-seven of these screws.

Last week the factory used 50,500 screws. Assuming a 1 percent loss through waste or damage, and that all the remainder were used, how many Wolzits of each type were made.

Solution to Puzzle No 54

The only time that the watch shows the correct time under the given conditions is at 5.48, so that must have been the time that I first met Jamie. A number of entries suggested 4.16 but $LN(4 \times 16) = 4.158$ and the question states that only the first two digits to the right of the decimal point are displayed.

Note in the program how neither the hour nor minutes can equal zero. This is to prevent an error condition — LN(0) gives an invalid argument. Note also Line 70 where additional zeros are added to the string \$S\$ to ensure that it is of sufficient length when it is sliced in Line 80.

```
10 LET H = 1
20 LET M = 1
30 LET HS = STR$ H
40 LET MS = STR$ M
50 IF LEN MS = 1 THEN LET MS = "0" + MS
60 LET TS = HS + "." + MS
70 LET SS = STR$ LN (H + M) + "0000"
90 LET M = M + 1
100 IF M = 60 THEN LET H = H + 1
110 IF M = 60 THEN LET M = 1
120 IF H = 24 THEN STOP
130 GOTO 30
```

Winner of Puzzle No 54

The winner is Gilbert Rigot, Avenue Demolder, B-1342, Ottignies/LIN, Belgium, who receives £10.

Top 10

- Vic20**
- 1 (8) Introduction to Basic Part 1 (Commodore)
 - 2 (3) Race (Commodore)
 - 3 (4) Blitz (Commodore)
 - 4 (—) Strategic Advances (Commodore)
 - 5 (1) Panic (Bug-Byte)
 - 6 (7) Asteroids (Bug-Byte)
 - 7 (2) Cosmoarts (Imagine)
 - 8 (5) Wacky Walkers (Imagine)
 - 9 (8) Armo (Audilogic)
 - 10 (—) Introduction to Basic Part 2 (Commodore)

*Cartridge (Figures compiled by Boots & Co, London).

Top 10

- Spectrum**
- 1 (1) Flight Simulation (Pison)*
 - 2 (2) The Hobbit (Melbourne House)*
 - 3 (3) Penetrator (Melbourne House)*
 - 4 (5) Horace Goes Skiing (Pison/Melbourne House)
 - 5 (4) Transylvanian Tower (Richard Shepherd)*
 - 6 (7) 3D Tanks (DK Tropical)
 - 7 (8) Arcadia (Imagine)
 - 8 (6) Football Manager (Addictive Games)*
 - 9 (10) Chess (Pison)*
 - 10 (8) Planet of Death (Arcadia)

*Requires 48K. (Figures compiled by WH Smith and Son Ltd)

Top 10

- Atari**
- 1 (1) Zaxxon (DataSoft)
 - 2 (3) Miner 2049er (Big Five)*
 - 3 (7) Preppie II (Adventure International)
 - 4 (—) Golf (Pakman)*
 - 5 (—) Shamus (Synapse)
 - 6 (10) Protector 2 (Synapse)*
 - 7 (9) Pharaoh's Curse (Synapse)*
 - 8 (—) Floyd of the Jungle (Microprose)*
 - 9 (—) AS (Sunderbund/S)
 - 10 (—) Necromancer (Synapse)*

*Cartridge, 32K cassette, 32K disc, 64K disc.

(Figures compiled by Calisto Computers, Birmingham G21 632 4458)

Top 10

- Dragon**
- 1 (1) The King (Microdeal)
 - 2 (2) Space War (Microdeal)
 - 3 (4) Defence (Microdeal)
 - 4 (5) Alcatraz (Microdeal)
 - 5 (8) Caterpillar Attack (Microdeal)
 - 6 (—) Space Monopoly (Microdeal)
 - 7 (—) Mansion Adventure (Microdeal)
 - 8 (8) Chess (Dragon Data)
 - 9 (—) Typing Tutor (Dragon Data)
 - 10 (—) Dragon Trek (Salamander)

(Figures compiled by Boots & Co, London)

BBC*

- 1 (2) Rocket Raid (Acornsoft)
- 2 (4) Planets (Acornsoft)
- 3 (7) Great Britain Ltd (Simon W Hessel)
- 4 (—) Inheritance (Simon W Hessel)
- 5 (1) Snapper (Acornsoft)
- 6 (8) Arcadians (Acornsoft)
- 7 (—) Meteors (Acornsoft)
- 8 (—) World Travel Game (Simon W Hessel)
- 9 (10) Chess (Computer Concepts)
- 10 (3) Chess (Program Power)

*All Model B. (Figures compiled by Micro Management, Ipswich G473 59161)

ZX81*

- 1 (1) Flight Simulation (Pison)
- 2 (3) OS Scramble (Quickdraw)
- 3 (2) 3D Monster Maze (New Generation)
- 4 (4) Chess (Pison)
- 5 (5) Space Raiders (Pison)
- 6 (5) Catatombas (LJK Grey)
- 7 (7) Galacticas (LJK Grey)
- 8 (5) 10 Games for 1K (LJK Grey)
- 9 (9) Gup (Campbell Systems)
- 10 (10) Scramble (Woodside)

*All 128K except where noted. †Runs in 1K. (Figures compiled by WH Smith and Son Ltd)

Books

- 1 (1) Spectrum Rom Disassembly, Logan (Melbourne House)
- 2 (3) Vic Programmer's Reference Guide, Commodore (Commodore)
- 3 (4) Spectrum Hardware Manual, Dickens (Melbourne House)
- 4 (7) Assembly Language Programming for the BBC Micro, Bimbaum (Macmillan)
- 5 (8) Commodore 64 Programmer's Reference Guide, Commodore (Commodore)
- 6 (—) Mapping the Atari, Chadwick (CompuLink)
- 7 (—) The Complete Forth, Winfield (Sigma)
- 8 (9) 6809 Assembly Language Programming, Lavenhal (Osbourne)
- 9 (8) Enter the Dragon, Carter (Melbourne House)
- 10 (—) Computer's First Book of Vic, various authors (CompuLink)

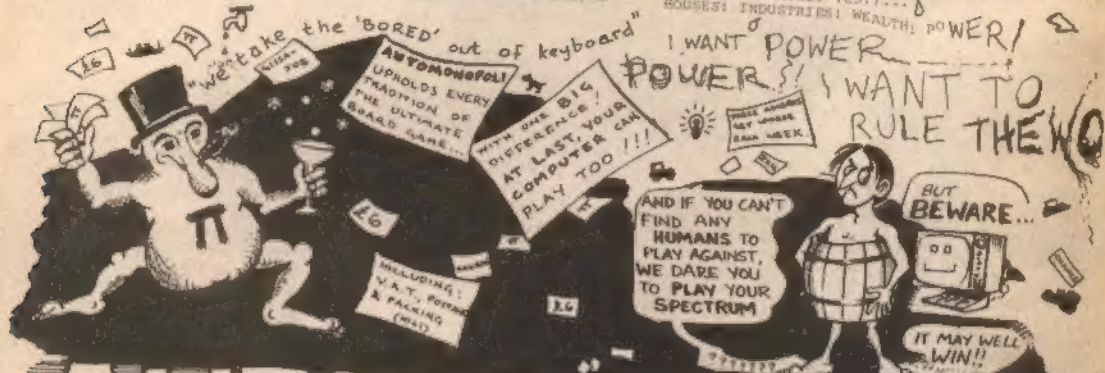
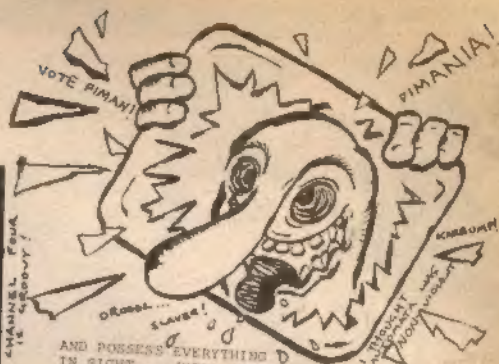
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